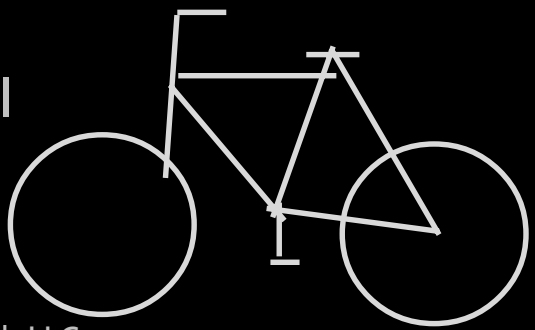
BICYCLE MASTER PLAN

County of Imperial Bicycle Master Plan Update

Prepared for the
County of Imperial



Prepared by
Wallace Roberts & Todd, LLC

WRT

September 10, 2003

IMPERIAL COUNTY BICYCLE MASTER PLAN

COUNTY OF IMPERIAL

Board of Supervisors
Supervisor Victor Carrillo
Supervisor Hank Kuiper
Supervisor Joe Maruca
Supervisor Wally Leingruber
Supervisor Gary Wyatt

Staff Recognition

Timothy Jones
Kathi Williams
Neil Jorgenson

PREPARED BY WALLACE ROBERTS & TODD, LLC

September 10, 2003

Planning for Bicycle Facilities ----

"…When there are no safe, accessible places for children to play or adults to walk, jog, or ride a bike, that is a community responsibility."

David Satcher, Surgeon General,
Call to Action to Prevent and Decrease Overweight and Obesity, 2001

("Increasing Physical Activity Through Community Design",
May 2002,
National Center for Bicycling and Walking)

TABLE OF CONTENTS

Appendix

Figures

Tables

DEFINITIONS

Terms or acronyms used in this document or acronyms are defined below:

AASHTO - American Association of State Highway and Transportation Officials

Accessway – a formalized path, walkway, or other physical connection that allows pedestrians to efficiently reach destinations.

ADA - The Americans with Disabilities Act (civil rights legislation passed in 1990, effective July 1992). Federal law prohibiting discrimination against people with disabilities. Requires public entities and public accommodations to provide accessible accommodations for people with disabilities

ADAAG - Americans with Disabilities Act Accessibility Guidelines. Provides scoping and technical specifications for new construction and alterations undertaken by entities covered by the ADA.

ADT - Average Daily Traffic - The measurement of the average number of vehicles passing a certain point each day on a highway, road, street, or path.

APBP – Association of Pedestrian and Bicycle Professionals, a non-profit organization dedicated to promoting walking and biking nationwide.

Arterial (Road) - divided or undivided, relatively continuous routes that primarily serve through traffic, high traffic volumes and long average trip lengths. Traffic movement is of primary importance, with abutting land access of secondary importance.

Bicycle - A vehicle having two tandem wheels, either of which is more than 0.4 m. (16 in.) in diameter, or having three wheels in contact with the ground, any of which is more than 0.4 m. (16 in.) in diameter, propelled solely by human power, upon which any person or persons may ride.

Bicycle Facilities - A general term denoting improvements and provisions made by public agencies to accommodate or encourage bicycling including bicycle paths, bike lanes, parking and storage facilities, lockers and showers, maps of bikeways, and marked routes and shared roadways not specifically designated for bicycle use.

BHSI - Bicycle Helmet Safety Institute *(*www.helmets.org*)* – a national non-profit organization dedicated to disseminating information on the merits of wearing helmets and promoting safe bicycling.

Bicycle Lane (Class II) - A portion of a roadway (typically 1.2-1.5 m.) which has been designated by signing and pavement markings for the preferential or exclusive use by bicyclists.

Bicycle Path (Class I) – A separated paved or hard surface (typically 2.4 m.) that serves the exclusive use of bicycles and pedestrians.

Bicycle Route (Class III) - A system of roadways that is linked by signs that designates the roadway as a route for bicyclists, generally providing a preferred route.

Bikeway - Any road, path, or bikeway which, in some manner, is specifically designated as open to bicycle travel, regardless of whether such facility is designated for the exclusive use of bicycles or is to be shared with other transportation modes.

BTS – Bureau of Transportation Statistics

CCBRES – California Center for Border and Regional Economic Studies

Capacity - The maximum umber of vehicles that have a reasonable expectation of passing over a given section of roadway during a given time period.

CIP - Capital Improvement Program Clearance – A 5-year program adopted by the Council for appropriating money for capital improvements such as roads, sewer, and water.

Clearance, Vertical - The height necessary for the safe passage of bicyclists as measured in a vertical plane.

Collector (Road) - A road designated to carry traffic between local streets and arterials, or from local street to local street.

Edge Line - A painted or applied line to designate the edge of the road (typically 150-200 mm, 6-8 inches wide).

Enhancement funds - Under TEA 21, set aside funds for twelve categories of projects including bicycling and pedestrian facilities and trails.

Grade-separated Crossing – A facility such as an overpass, underpass, skywalk or tunnel that allows pedestrians and motor vehicles to cross each other at different levels.

Greenway – a singular or a series of vegetative, linear corridors, natural or man-made, which may contain active or passive recreational uses or which may prohibit human activity altogether in order to preserve sensitive areas. These are usually associated with riparian systems, but may also include transportation corridors.

IVAG – Imperial Valley Association of Governments – The designated regional planning organization for mandated by the federal government to research and draw up plans for transportation, growth management, hazardous waste management, and air quality. IVAG serves under Southern California Association of Governments (SCAG), the larger metropolitan organization that includes Imperial County.

ISTEA - Intermodal Surface Transportation Efficiency Act of 1991. Federal legislation guiding the expenditure of federal highway funds for bicycle, pedestrian, and other improvements. It provided new funding opportunities for sidewalks, multi-use paths, recreational trails, and bicycle facilities. ISTEA is now superseded by the Transportation Equity Act for the 21st Century.

Lateral - The width required for safe passage of a bicyclist as measured in a horizontal plane.

Local Road – A road that serves individual residences or businesses, and /or distributes traffic within a given urban or rural area.

Local Access road – also known as Side Access lanes – traffic lanes within a multiway boulevard street configuration that are separated from thru-lanes by a median; lanes are slower providing local access and may provide on-street parking.

Mixed-use Trail – A trail or pathway that permits a different uses that are complementary to each other and provide opportunities for joint, non-motorized use.

NAFTA – North American Free Trade Agreement

NHTSA – National Highway Traffic Safety Administration (www.nhtsa.org)

Lateral Clearance - The distance between the edge of a roadway or bikeway and a fixed object. Also, the separation distance a roadway user needs to feel safe operating near a fixed object.

Maquiladora – Assembly plants located in Mexico, mostly along the northern Mexican border. Materials are exported to these plants where they are assembled into finished products and then imported back into the country of origin for sale.

NHS - National Highway System – Federal safety program for funding safety improvements for interstate corridors.

RTIP - Regional Transportation Improvement Plan – The regional plan adopted yearly by IVAG. Used for identifying and funding future roadway improvements.

Shared Roadway - Any roadway upon which a bicycle lane is not designated and which may be legally used by bicycles regardless of whether such facility is specifically designated as a bikeway.

Shoulder (Paved) - Portion of highway or roadway that is contiguous to the traffic lanes to allow access for emergency vehicles, bicyclists, and where designated, pedestrians.

Staging Area - A designated area at a beginning of a trail or bikeway that is established for the use and comfort of trail users. Generally, it will include parking areas and other amenities such as, restrooms, sign kiosks, waste receptacles, picnic tables, benches and water fountains.

STP – Surface Transportation Program – Federal program for allocating grant funds for roadway improvements.

TEA 21 – Transportation Equity Act for the 21st Century – An umbrella federal program for providing funds to a variety of transportation related improvements programs. It provided funding opportunities for pedestrian, bicycling, and public transit facilities, and emphasizes inter-modalism, multi-modalism, and community participation in transportation planning initiated by ISTEA.

Traffic Calming – A set of techniques that reduce the speed and aggressiveness of traffic.

Traffic Markings – All lines, words, or symbols, except signs, officially placed within the roadway to regulate, warn or guide traffic.

Traffic Sign – A device mounted on a fixed or mountable support to convey a message or symbol to regulate, warn or guide traffic.

Volume – The number of vehicles, pedestrians, or bicyclists passing a given point during a specified period.

CHAPTER 1 EXECUTIVE SUMMARY

A. Significant Findings

Purpose

In 1999, the County of Imperial adopted a comprehensive Bicycle Master Plan to plan for and develop bicycle facilities within the unincorporated areas of Imperial Valley. At that time, no other city in Imperial Valley had previously prepared or adopted a similar comprehensive bikeway plan. Since then, each of the seven cities in the Valley has adopted or will be adopting a Bicycle Master Plan for their community in the near future. This document is an update to the adopted Countywide Bicycle Master Plan prepared to accomplish the following:

1. Incorporate the connecting proposed bicycle routes from each city to the corresponding route in the County to ensure continuity with the regional plan.
2. Provide updated information and analysis of the needs of bicyclists that will aid in singular or multi-agency grant applications for funding bicycle improvements.
3. Compare the Imperial County Master Plan to California Department of Transportation's requirements and augment the Master Plan as necessary to meet those objectives.

Setting

Imperial County is located in the southeast corner of California border by Riverside County on the north, by San Diego County on the west, on the south by Baja, Mexcio and on the east by the Colorado River which forms a boundary between California and Arizona. Covering over 4,175 square miles, it is the 9th largest county in California.

The focus of the Master Plan is the unincorporated areas of Imperial Valley (See Figure 1.1) and the community of Ocotillo located to the west of Imperial Valley at the base of the Sugarloaf Mountain where Interstate 8 and State Route 98 intersect. The flat terrain, generally mild, sunny climate, and low traffic volumes provide many opportunities for cycling.

Background

The County of Imperial's General Plan, Circulation Element and Open Space Element, provide a solid planning basis for the Bicycle Master Plan. Since the adoption of the Master Plan, the County received grant funds for the construction of bicycle lanes along Ross Road and La Brucherie Road. Construction is planned for late 2003.

Increased use of park facilities, such as the BMX track at Sunbeam Lake, or at after-school activities by children on bicycles has been a source of public concern due to numerous near misses between cyclists and motorists. In the unincorporated area of the County, there was a reported accident at Bombay Beach documented by Statewide Integrated Traffic Electronic Retrieval System, 1998. Bicycle and vehicle collisions occur more frequently in urbanized settings such as Calexico and El Centro where there is more traffic, more roadway crossings, more bicyclists and generally a higher degree of potential conflict. However, the potential for direct conflicts with bicycles and motorists is a major issue anytime there are bicyclists and less

than adequate conditions or facilities for bicyclists. Providing education of bicycling and implementing bicycle facilities can aid in the improvement of bicycle safety in the Valley.

In spite of the fact that there are a limited number of bicycle facilities in Imperial County and no comprehensive bicycle system, there is a growing interest in cycling and numerous cyclists bike on a regular basis for both recreation and commuting to work and school which is evident by the bicycle groups that regularly cycle 20-30 miles weekly.

B. Major Recommendations

Vision

The following statement summarizes the County's goals for future bicycle facilities and serves as the overall vision for developing bicycling facilities in the County:

> ***To encourage and promote cycling in the County through the development of a regional bicycle facility network that integrates bicycling in the valley as a safe and convenient form of transportation achieved through engineering, education, enforcement, and encouragement.***

Regional Bicycle Network

The Bicycle Master Plan (Figure 1.2) recommends implementation of a 252-mile system of bicycle lanes, routes, and pathways that will link to schools, shopping, employment and future expanding residential areas.

The proposed 253.5-miles of bikeways consists of 42 miles of Class I bicycle paths and 211.5 miles of Class II bicycle lanes. Class III bicycle routes are recommended in the interim until bicycle lanes can be installed where there is a minimum of a four foot wide paved shoulder. The estimated cost to construct the entire network is $6,418,000. The phasing plan recommends construction of Route 1 – Class II bicycle lanes along Ross Road to La Brucherie Road to Drew Road at a estimated cost of $570,000. The County received funding for a portion of that route from a Bicycle Transportation Grant (BTA) and construction is scheduled for 2003.

In many instances, Class III bicycle routes can improve existing bicycling conditions by providing a designating route for cycling and providing recognition of the growing cycling community. Cyclists, who participated at the community workshop prior to adoption of the Bicycle Master Plan in 1999, felt that by providing Class III bicycle routes signs as an interim measure, motorists would become aware of the cycling community and get accustomed to sharing the roadway with cyclists.

This Bicycle Master Plan outlines the planning criteria and descriptions of each proposed bikeway route by facility classification. The bikeway system will be implemented over time, as funding opportunities become available through grant programs, implementation of roadway improvements, regular roadway maintenance, or new development. The ultimate system is designed to meet the needs of cyclists as Imperial Valley grows.

CHAPTER 2 INTRODUCTION

A. Purpose

The Board of Supervisors for the County of Imperial recognizes that there is a growing interest in the region for safe, effective bicycle facilities for commuting and recreation for a variety of users. In response to the community, in 1998 the Board prepared a comprehensive planning document for developing bicycle facilities. Understanding that an effective bikeway system can increase opportunities for commuting, reduce traffic, expand recreation facilities, increase air quality, enhance personal health, and increase tourism, the County Board of Supervisors adopted the Bicycle Master Plan in 1999. This plan recommends a 253.5-mile system of bicycle facilities that connect existing and developing residential areas to destination points for both commuter and recreation bicyclists. The County will use the plan as a tool when planning future roadway facilities, improvements to existing roadways, scheduling capital improvements, and applying for grant funds for bikeway facilities.

Additionally, this plan responds to the provisions of the California Bikeways Act, which describes specific requirements to be included in a Bicycle Master Plan. A Bicycle Master Plan or Bicycle Transportation Plan must comply with the program guidelines as set forth in Section 890-894.2 of the State of California, Streets and Highways Code for eligibility of grant funds to construct bicycle facilities through the Bicycle Transportation Account.

To meet Caltrans requirements, the Bicycle Transportation Plan or the Bicycle Master Plan must include the following elements:

Caltrans Checklist:

1. A needs assessment of the estimated number of existing and future bicyclists in the project area (Table 1, pp. 26)
2. A map and description of existing and proposed land uses. (Figure 1.3, pp. 15)
3. A map and description of existing and proposed bikeways, destination points, parking facilities, support facilities, (See Figure 2.0 pp. 44)
4. A description of bicycle safety and education programs, (pp. 30)
5. A community participation program, (pp. 18)
6. A discussion of how the plan is consistent with other plans, (pp. 19-21)
7. A description of each project proposed in the plan and a priority list for implementation (pp. 45-49. Pp. 64-65)
8. A description of past expenditures for bicycle facilities (pp. 16) and future financial needs for projects that will improve safety and convenience for bicycle commuters. (Table 5, pp. 65)
9. Plan Review and Update (pp. 41)

B. Background

The purpose of this Master Plan is to update the existing Bicycle Master Plan to incorporate the links from each agency in the valley to ensure continuity and connectivity. This comprehensive planning document will serve as a tool for the County of Imperial to use when planning future bicycle facilities and roadway improvements. Currently, no bicycle facilities are provided in the unincorporated area. Two routes, Ross Road and La Brucherie Road bicycle lanes, have been funded through Bicycle Transportation Account Funds (BTA) and will be constructed in late 2003. When the 1999 Master Plan was adopted, the County intended to coordinate and participate with joint applications with other agencies in the valley to pursue grant funds for implementation. However, each city had not identified a bicycle system within their incorporated boundaries. Since that time, each of the seven cities, Brawley, Calexico, Calipatria, El Centro, Imperial, Holtville, and Westmorland, adopted a Master Plan or prepared a Master Plan that is pending adoption. This updated Bicycle Master Plan recommends a system of bicycle routes that will, upon implementation, connect to routes proposed within each of the cities.

C. Project Study Area

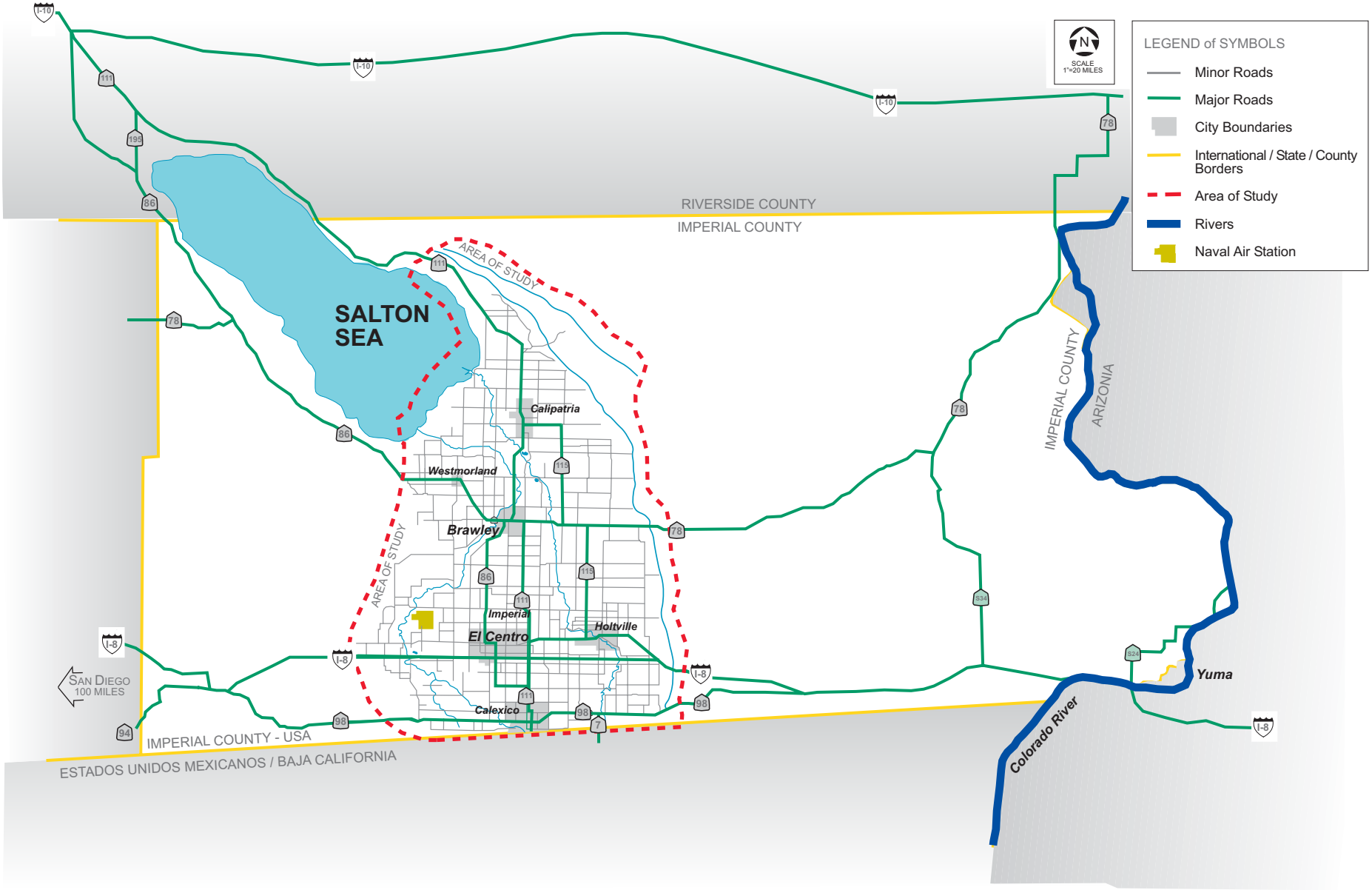
Imperial County is located in the southeast corner of the California, bordered by Riverside County on the north, by San Diego County on the west, by Baja, Mexico on the south and by the Colorado River and the Arizona border on the east. Covering over 4,175 square miles (U.S. Census 2000 data) of varying terrain from 235 feet at the Salton Sea to 4,548 feet at Blue Angel Peak, it is the 9th largest county in California. (Figure 1.1) The project study area focuses on the unincorporated areas of Imperial Valley including the community of Ocotillo to the west of El Centro at the intersection of Interstate 8 and State Route 98. (See Figure 1.2). Although this plan focuses on the unincorporated County areas where the majority of the population resides, the proposed county bicycle facilities will link to each of the cities with the county.

Imperial County has a population of 142,361 (U.S. Census, 2000). Approximately 50% of the County land area is underdeveloped with the largest populated area located between the Westside Canal and the Highline Canal known as the Imperial Valley. The Imperial Valley encompasses seven incorporated cities, Brawley, Calexico, Calipatria, El Centro, Holtville, Imperial and Westmorland comprising seventy-one percent of the population.

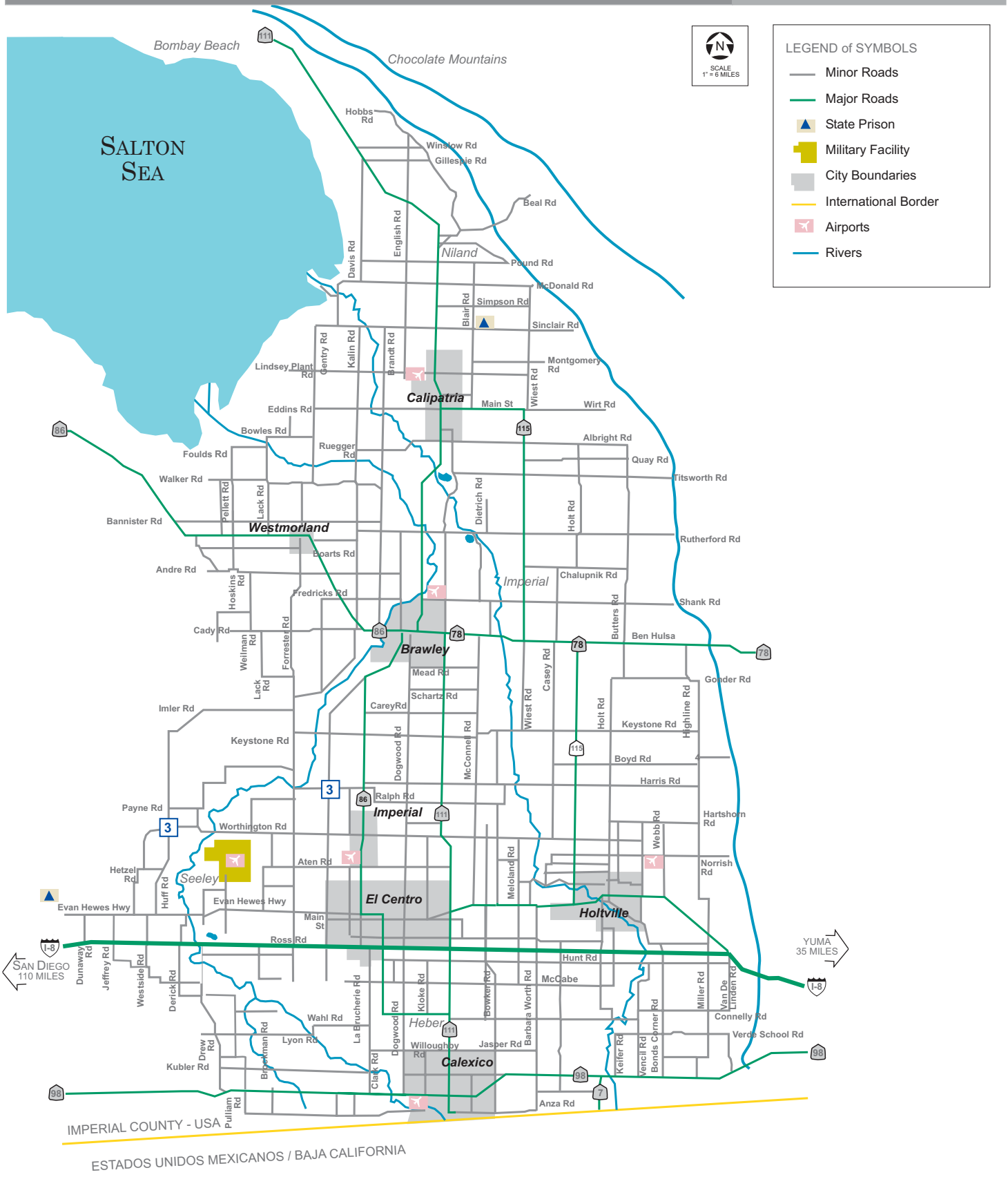
D. Historical Context

The County of Imperial was originally part of San Diego County, founded August 7, 1907. Although settlements were established along the Butterfield Stage Route as early as 1858, no development took place until water was brought into the area in 1901. Transformed from an area of desert sand and rugged mountains, water from the Colorado River through a system of canals brought agriculture. Still a strong and viable industry, agriculture brings in a gross income of over one billion dollars annually putting Imperial County as one of the top 10 agricultural counties in California.

Imperial Valley Vicinity Map



Imperial Valley Location Map



E. Existing Conditions

Imperial Valley provides many opportunities for the avid cyclist who enjoys cycling for miles with limited cross traffic, low traffic volumes, and wide expanses of open land. Imperial Valley's fairly level terrain sustains hot, dry temperatures ranging from the low to mid 30's in January to the highs of over 110+ in July with rainfall averaging 2.92 inches annually. From October to May daytime temperatures are mild and dry creating ideal conditions for cycling. Each of the seven cities is comprised of dense single-family residential development with a variety of retail and business services available. Surrounding each of these cities lie large expanses of agricultural land. Several small communities, such as Niland and Seeley, are situated amid these fields of lush agriculture. These agricultural areas comprise much of the County of Imperial. Numerous parks and small lakes, as well as the Imperial Valley College campus and the Salton Sea, are located within the unincorporated County. (Figure 1.3)

Transportation System

The County is served by Interstate 8 (I-8) providing the primary east/west route from San Diego to Yuma, Arizona. Major arterials extending north and south from I-I include State Routes 86 and 111 connecting Heber and Calexico south of I-8 to El Centro, Imperial and Brawley in the north. SR86 continues along the westside of Salton Sea serving the City of Westmorland and the Salton City area, joining Interstate 10 at Indio in Riverside County. SR-111 serves communities along the northeast side of the Salton Sea from Calipatria to Bombay Beach connecting to SR-86 at Mecca. SR-78 connects the off-road recreational vehicle area to Brawley and Westmorland and continues on to Borrego Springs in San Diego County. SR-98 is a major east-west corridor located in the southern portion of Imperial County connecting to I-8 at the east and west and traversing through the City of Calexico at the border of Baja-California.

Designed in a grid system, the countywide road system consists of three major types of roadways:

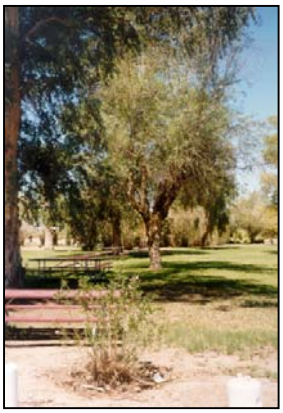
1. Truck routes – includes SR-86, SR-111, SR-78, and SR-115. These are direct routes, connecting to the major cities, employment, parks, and retail centers. These routes are used by cyclists who are competent and comfortable riding along with fast moving traffic.
2. Paved roadways with low traffic volumes and frequently wide shoulders. These are ideal for bicycling and are frequently selected by long-distance cyclists for training and exercise.
3. Roadways designed to handle agricultural equipment are frequently paved only at a 22-24 feet width to allow for one-way equipment traffic spanning across the pavement to reduce wear and tear on the asphalt. Cyclists on these roadways, must be aware of the potential to encounter large agriculture equipment. Cyclists may choose one of these routes due to low traffic volumes, especially during the periods when there is minimal agriculture activity and crops are not being harvested.

In the past, bicycle facilities have not been included in the design and construction of local roadways. The County of Imperial can play a key role in shaping the future for Imperial Valley. By taking a lead in identifying potential bicycle facilities and setting a prioritization plan for implementation, the County of Imperial will foster a more balanced regional transportation system that will serve as the catalyst for other valley cities.

In 2001, the County Public Works Department extended the roadway along La Brucherie Road from Worthington Road to Neckel Road to gain adequate roadway width for a Class II bicycle lane. The bicycle lane project was made possible through a Bicycle Transportation Account (BTA) grant from Caltrans. The total cost of the facility was $95,760.06 with $65,340 funded through the BTA.

Recreational Opportunities

Easily accessible by I-8 or I-10, the Colorado River offers a wide variety of recreational activities. At the northwest corner of Imperial County lies the Salton Sea, known for its fishing, duck hunting, and wildlife preserves of both rare and uncommon birds such as the Pacific Flyway. As California's largest inland body of water, it covers 330 square miles. The Salton Sea State Recreation Area offers a fifteen-mile shoreline along the northeastern portion of water-oriented recreation, picnicking, camping, fishing, and wildlife appreciation.



Numerous public and private recreation areas are located within Imperial Valley. Imperial County's parks are primarily designed for passive recreation such as picnicking, fishing, and birdwatching. These County parks include: Sunbeam Lake, Red Hill Marina, Niland Marina, Wiest Lake, Palo Verde Marina, and Waler Roadside Park. Sunbeam Lake offers a BMX facility that attracts children and families to the man-made mountainous terrain for mountain biking. Picnicking, boating and fishing are also conducted there. Located directly east of El Centro and south of the Naval Air Station at Seeley, many cyclists bike to the facility along Drew Road and Ross Road. However, there are no bicycle facilities on these roadways.

State facilities include the Salton Sea State Recreation Area and Picacho State Recreation Area north of Winterhaven. Squaw Lake Recreation area at the Colorado River near Yuma, Arizona, Bureau of Land Management facility, offering camping and recreational vehicle sites adjacent to the Colorado River. The State Department of Fish and Game manage two wild life refuges at Wister Lake near Niland and Finney Ramer Lake near Calipatria. These facilities are primarily rural, natural preserve areas attracting wide varieties of migrating birds as well as bird watchers. Facilities such as picnicking and restrooms are not offered at these natural preserves.

Numerous other local parks are located within other cities of Imperial Valley: Brawley, Calexico, Calipatria, El Centro, Holtville, Imperial, and Westmorland. These parks offer active playing fields for league sports, swimming pools for competitive swimming, equestrian training, playgrounds, picnicking with shelters, and wide open space areas for free play. Special events such as annual rodeos are conducted Brawley's Cattle Call Park and the Fairgrounds in Imperial.

Employment Characteristics

Over the past 30 years, agriculture has been the primary employer in the valley. Agricultural jobs continue to grow with an overall increase of 20% from 1992 to 1999. The industry follows a

seasonal pattern with higher employment during the winter months. Imperial County is a leading producer of row crops and livestock and is often referred to as the state's "winter salad bowl" because of the quantity of vegetables and lettuce harvested during the winter months. The total wage and salary employment in Imperial County, including agriculture has grown from 46,200 jobs in 1993 to 50,788 in the year 2000 (U.S. Census data 2000 and Imperial Irrigation District 1998). As the governmental center of Imperial Valley, El Centro supports the regional administrative, financial, medical, and governmental services as well as the City's Civic Center. As a major employer, El Centro's governmental facilities include the County Administration Center, Imperial Valley Association of Governments, Superior Courthouse, Sheriff's Department, Probation Department, Department of Education, and the County adult and juvenile detention facilities.

Employment for year-round residents is changing, however, with a reduction of agriculture employment from 35.7% in 1969 to 11.9% in 2000. (CCBRES, November 2001). Nonfarm workers have increased nine of the last ten years, mainly due to the large state prison in Calipatria and the second prison in Seeley.

Geothermal exploration is being conducted in the unincorporated communities of Heber and Niland. Currently there are 15 geothermal plants employing over 600 employees with another approved for construction in the Heber area. Mining for gold in the Glamis area and Cargo Muchacho Mountains east of Brawley and gypsum east of Ocotillo provide additional employment.

The maquiladora industry employment, tripling over the past eight years, is credited with an increase in employment on both sides of the California-Mexico border and increase of the movement of goods movement due to the implementation of the North American Free Trade Agreement (NAFTA) and the construction of a new truck border crossing east of Calexico. Evidence of the cross-border employment is noticeable with increased border traffic including vehicles, pedestrians, and bicyclists. Trade is expected to expand the job market from 9,800 to 11,500 regionally resulting in an increase of 17.3% during the period of 1999-2006. Government industry employment is expected to grow In the valley by 14.9% during that same five year period due primarily from new jobs in local education and the completion of the second state correctional facility. (California Employment Development Department, July 31, 2002).

F. Citizen and Community Involvement

In order to encourage public input, support, and interest for bicycle facilities, the County of Imperial conducted a public workshop on September 30, 1999 at the County Administration Building in El Centro. The workshop was attended by avid bicyclists from the El Centro and Calexico areas. The participants stated they cycle 25 miles or more on a regular basis throughout the county. An organized cycle group conducts weekly rides that encompasses 25 miles or more with 15 - 20 riders.

The major concern expressed by the participants is that there are no bicycle facilities in Imperial Valley. Although interest to develop bicycle facilities in the Imperial Valley is growing, there is still a lack of financial commitment and/or foresight to include bicycle facilities in routine road improvement projects by the public agencies and a lack of awareness by the community of the opportunities available. The workshop participants felt that education is of prime importance. Motorists are frequently unaware that cyclists have the right to share the roadway with

motorized vehicles. Cyclists cited examples of motorists and truck drivers unwilling to share the roadway with cyclists creating hazards for cyclists.

Currently, routes are selected by the riders based on some simple characteristics:

1. Wider road width or paved road shoulder,
2. Reduced traffic or traffic speeds,
3. Connections to residential communities,
4. Scenic vistas, and
5. Fewer trucks.

The participants identified a 3-step process for developing bicycle facilities in Imperial Valley. They felt that initially Bike Route signs should be placed along the routes used regularly to provide awareness of cyclists. Secondly, bicycle lanes should be developed along specific highly traveled or high traffic volume roadways. Finally, multi-use paths separated from the roadway should be developed for recreationists, tourists, young cyclists, disabled, and roller bladers.

Roadways where participants regularly cycled were plotted on an Imperial Valley map with recommendations that these routes be considered for future bicycle facilities. These routes will be discussed in Chapter 6, Bikeway Plan.

Periodic reviews of the bikeway network at a minimum of every four years is recommended to assess if the plan should be modified to reflect changing conditions. Public workshops are also recommended to provide input on possible changes. Additionally, a public point of contact should be established at the County of Imperial to coordinate public concern and/ or comments, public work improvements, and to pursue grant funds.

G. Relationship to General Plan and Other Plans

The Bicycle Master Plan represents an implementation tool of the County's General Plan. The General Plan identifies key goals and objectives supporting and encouraging the development of bicycle facilities. The Bicycle Master Plan is consistent with the General Plan and will be adopted by the County Board of Supervisors as a planning tool supporting the General Plan. The following are goals and objectives identified in the General Plan supporting bicycle facilities.

General Plan - Circulation Element Goals and Objectives

Goal: *"***Consider all modes of transportation including motor vehicle, mass transit, air transportation, and non-motorized transportation**."

Objective: "Develop and improve bicycle routes and pedestrian walkways."

Objective: "Consider the needs of bicyclists in the design, construction, and maintenance of all County roads, with specific attention to those roads established and defined in a network of key bicycling routes."

Objective: "Ensure the safety of the traveling public, including pedestrian and bicyclists."

Objective: "Attempt to reduce motor vehicle air pollution."

Goal: "**The County shall make every effort of develop a circulation system that highlights and preserves the environmental and scenic amenities of the area**."

Objective: "Establish various systems of scenic recreational travel utilizing multiple transportation modes."

Goal: "**Participate in and assist with coordinating regional efforts that integrate the County Transportation System with the Regional Transportation System**."

Objective: "The County shall provide necessary facilities to obtain balanced use of all travel modes to address the transportation needs of all ages and to provide mobility for a variety of trip purposes. The County shall generally recognize the following priorities for new transportation facilities: vehicular, freight movement, transit, pedestrian, and bicycle."

Objective: "Encourages a range of transportation opportunities while reducing the dependency on automobiles."

Policies: *"The county shall consider the use of bicycles during the design and implementation of the street system."*

"The county shall update and maintain a recreational trails bikeway plan to recommend use of bicycle routes. These routes shall connect residential areas with schools, parks, recreation areas, major employment centers, and neighborhood commercial centers."

"The county shall require that adequate off-street parking be provided for all properties. This assumes that on-street parking will not be available on prime, major, or secondary arterials, since it is necessary in most cases to utilize curb-to-curb width for vehicular traffic, transit, and bicycle uses."

Objective: "The goal of this (Non-Motorized Transportation) program is to enhance environmental and social benefits for the citizens of Imperial county by providing an integrated network system of bicycle and pedestrian facility for the safe and efficient movement in and through the County of Imperial."

"The goal of the bicycle facilities program is to provide an integrated bicycle circulation system, which includes facilities to promote the environmental and social benefits of commuter and recreational bicycling." "The bicycle circulation system and

associated bicycle facilities shall provide mobility and safety to all persons and areas within the County of Imperial."

Policies: *"Class II bikeways (on-street bike lanes) shall be planned into appropriate Prime, Major, and Secondary arterials."*

"The County shall cooperate with other governmental agencies to provide connection and continuation of bicycle corridors."

"The utilization of land shall integrate the bicycle circulation system with auto, pedestrian, and transit systems."

"The County shall seek funds at the private, local, state, and federal levels for the bicycle circulation system."

General Plan - Open Space Element Goals and Objectives

Goal: ***"Open Space shall be maintained to protect the aesthetic character of the region, protect natural resources, provide recreational opportunities, and minimize hazards to human activity."***

Objective: "Encourage the development and improvement of recreational facilities in Imperial county."

Objective: "Coordinate federal, state, and local agencies for trail-oriented recreational uses."

H. Consistency with Other Adopted Plans

Since the development of the Bicycle Master Plan for the County, each of the cities within the County of Imperial has prepared a Bicycle Master Plan with routes that link to the proposed regional facilities. Three additional routes were added to the County's bicycle network since the prepration of the first Imperial County Bikeway Master Plan in 1999: 1) A link from Holtville to El Centro along an abandoned rail line has been added for a Class I bicycle path; 2) A route from El Centro to Brawley along SR 111 was also added to accommodate bicycle lanes; and 3) A half-mile bicycle lane connecting the town of Ocotillo to the Ocotillo Community Park. The recommended bicycle system for the county has been updated to reflect these additional connections to ensure that when as each segment is constructed, there are no missing links. Joint applications with connecting cities and the county should be pursued for implementation grants.

Recommended bicycle facilities maps for each city are located in the appendix of this document for reference. The recommended bikeway network is described in Chapter 6 of this document.

CHAPTER 3 GOALS AND OBJECTIVES

In order to make bicycling a viable and recognized transportation alternative and a recreational choice, an identifiable and improved bicycle system of bike routes, lanes and paths regionwide is mandatory. With the 2000 census, the State of California saw an increase in the median income for a family of four to $47,493. Whereas, with a much lower median income of $31,870 in Imperial Valley, cycling becomes an efficient, economical transportation option for commuting to work and school. Without a doubt, regular cycling improves individual health and reduces air pollution for the region.

The vision guiding this Master Plan can best be expressed as follows:

> "The County of Imperial desires to encourage and promote bicycling as a safe and convenient form of transportation and recreation achieved through engineering, education, enforcement, and encouragement."

In addition to the supporting goals, objective and policies provided in the County's General Plan as discussed in Chapter 2, the following are key goals and objectives of the Bicycle Master Plan:

Goal 1: *A comprehensive, rational and equitable bikeway system connecting residential neighborhoods with parks, schools, city hall, and existing and future employment based on General Plan land use designations.*

Objective 2:
Provide bicycle access to major employment and retail centers, schools, parks and other destinations.

Objective 3:
Plan, design, and construct roadways that include facilities for bicyclists and where feasible, Class I multi-use paths for pedestrians, bicyclists, and disabled persons.

Objective 4:
When developing new schools, parks, residential communities, and retail/employment centers include bicycle facilities that expand the bicycle network or connect to proposed or existing routes.

Objective 5:
Reduce vehicle fuel consumption and the number of vehicular miles traveled by increasing non-motorized transportation trips.

Objective 6:
Increase the number of multi-modal transit facilities with bike facilities linking to bus stops served by bicycle lanes and install bike carriers on buses.

Objective 7:
Integrate bicycle facilities as part of the design and construction of new roadways and upgrade existing roadways.

Objective 8:
Establish a bicycle network that offers opportunities for cycling for all ages and abilities.

Objective 9:
Maintain the bikeway network by establishing a regular maintenance program.

Objective 10:
Pursue grant-funding programs for implementing the bikeway network.

Objective 11:
Assign a staff person or appoint a volunteer or committee to coordinate and implement and maintain the bikeway system.

Objective 12:
Cooperatively pursue joint multi-agency funding applications for implementation that will expand the regional bikeway network.

Goal 2:
School and commuter bikeways that are easily recognized by signs and accessible from residential areas through appropriate design.

Objective 13:
Develop educational programs that promote the safe and efficient travel of cyclists.

Objective 14:
Establish a regular education program that targets schools and adults to inform and educate about safety techniques, both for cyclists and for vehicles.

Goal 3:
Bicycle storage facilities and/or bicycle racks located at all parks, schools and at new major retail and employment centers or during major renovations of existing retail and employment centers.

Objective 15:
Provide bicycle access and bicycle parking at new employment, commercial, and transit destinations and at existing parks.

Objective 16:
Develop guidelines and/or standards to require bicycle parking with new commercial, industrial development and all new schools.

Goal 4:
Bikeways are integrated with roadway improvements and/or new construction projects based on the recommended bikeway network.

Objective 17:
Require that new development incorporate bicycle facilities within the development.

CHAPTER 4 BIKEWAY DEMAND AND BENEFITS

A. Demand for bicycle facilities

Generally, the demand for bicycle facilities is predicated on current use and public opinion or demand for new facilities. The unincorporated county has two bicycle facilities: a short, paved pathway separated from the road along the southern border of Imperial Valley College and five foot bicycle lanes along both sides of La Brucherie Road from Worthington Road to Neckel Road. Design is underway for two bicycle lane segments: Ross Road and La Brucherie Road. It can be assumed that only avid and competent cyclists venture out on the Valley's roadways without the benefit bicycle lanes or separated paved pathways. Since cyclists, may not encounter high traffic volumes early in the morning when it's cool or early evenings when the temperatures drop, cyclists may be more concerned about the condition of the roadways and the width of the roadway shoulder. Traffic generally consists of fast moving trucks on major roadways or large agriculture equipment taking up more than one lane of travel on the collector roads. Many would-be cyclists in the Valley avoid cycling on the roadways due to inadequate roadway width or poor paving surface.

The latent "need" for bikeways is the unrealized potential for more cyclists if there were adequate bicycle facilities. This latent need is difficult to quantify and requires reliance on evaluating other comparable communities to determine potential usage. During the months of August, September and October of 2000, surveys conducted by the Bureau of Transportation Statistics (BTS) identified that one in five adults reported using a bicycle in the last 30 days. The BTS also found that 7% or 2.9 million persons commute to work. The U.S. Census Bureau, Journey to Work: 2000, data identifies 1.9% of the population within the County of Imperial commute by bicycle. Data released March 2001, compiled by the Association of Pedestrian and Bicycle Professionals (APBP), "states that 79% of voters felt bicycle trails and lanes are important to creating safe communities." With the average household generating an average of ten vehicle trips each day, bicycle commuting could potentially reduce some of those trips, alleviate congestion and improve air quality.

When planning bicycle facilities, the various ages and levels of abilities of bicyclists should be considered in relation to the community and environment in which they live and cycle. The levels of cyclists may be stated as advanced, basic, and inexperienced, including children. These three classifications of cyclists should be considered and facilities planned that offer variety and different types of experiences.

> ***Advanced cyclists*** are highly experienced cyclists who ride frequently, are confident in cycling with motorized traffic, and can negotiate with less operating space. These cyclists generally range in age from 20 – 50+ years, representing 20% of all cyclists but accounting for an estimated 80% of all bicycle trips. They are comfortable traveling long distances, are accustomed to cycling in a variety of environments and will most likely choose to bicycle for commuting or shopping.
>
> ***Basic bicyclists*** are more casual riders, are less comfortable in traffic and have limited experience and skills. They form the largest group of bicyclists, but cycle occasionally and account for the largest group ranging in age from 9 years old to 50+ and are both male and female.

> ***Inexperienced cyclists and children*** form a separate group of bicycle riders. Children have minimal riding skill, little experience, limited physical capability, and are not comfortable riding with traffic or within the roadway. These cyclists lack confidence and judgement regarding safe cycling practices. Sidewalks, school grounds, parks, and Class I bicycle paths generally provide safe environments for the young riders.

In addition to designing bikeways for the type of bicyclists, bikeways should also be designed in accordance with the classification and characteristics of roadways. Bicycle compatible roadways designed to accommodate shared use for bicycles and vehicles best serve advanced cyclists. Basic riders are more comfortable with *designated roadways* with bicycle facilities that encourage bicycle use.

> A *compatible roadway* is one, which incorporates design features that allow a competent bicyclist to safely share the roadway with a vehicle. Design features may include traffic volumes, speeds and environmental setting, and signage. Typically, this facility is a Class III bicycle route (See Chapter 5 on classifications of bikeways).
>
> A *designated roadway* is one that encourages cycling through the use of lane markings and signage. Typically, this facility is a Class II bicycle lane. Other considerations for a designated roadway may include traffic conditions, appropriate width and geometrics, and directness of route. A Class I bicycle path is recommended for those inexperienced cyclists and other recreational uses since it is separated from the road and motorized traffic (See Chapter 5 on classifications of bikeways).

Using the 2000 U.S. Census, Journey to Work data, almost 1.9% (988) of all employed Imperial Valley residents commute primarily by bicycle *(U.S. Census 2000 labor force increased by a 2.4% growth rate from 2000 to 2001).* This does not include those who ride to work less than 50% of the time, nor does it always include those who may walk or ride to transit and list "transit" as their primary mode. The U.S. Department of Transportation in their publication entitled "National Walking and Bicycling Study" (1995) sets as a national goal to double current walking and bicycling mode shares by the year 2010. Assuming that a comprehensive bicycle and pedestrian system is in place, this would translate into a commute bicycle mode share of 3.8% or 1,976 bicycle commuters in Imperial County.

Bicycling is one of the most popular forms of recreational activity in the United States, with 46% of Americans bicycling for pleasure. This figure would indicate that about 65,486 permanent residents in Imperial County do or would like to bicycle for pleasure. If nothing else, this indicates a latent demand for facilities and a potent constituency to push for better facilities. Another way of saying this is "if you build it, they will come." In areas where there is an extensive bicycle network, the bicycle share of commuter trips is much higher. In Seattle, Washington, general bicycle/pedestrian mode share is as high as 4% of commute trips (compared to 2% for the surrounding region). In the vicinity of the University of Washington, this mode split approaches 30%.

Table 1, below, provides a detailed summary of bicycle demand and benefits for the County of Imperial.

TABLE 1 DEMOGRAPHICS AND BICYCLE TRANSPORTATION BENEFITS	
Population*	142,361
Estimated County Resident who would like to Bicycle for Pleasure (46% of residents)	65,486
Current Bicycle Commute Mode share of 1.9%***	988
Future Bicycle Commute Mode Share of 3.8%	1,976
School-related bicycle commuters (20% of enrolled students)	6,771
Total future bicycle commuters	8,747
Reduced Vehicle Trips/Year	1,072,300
Reduced Vehicle Miles/Year**	7,506,100
Reduced PM10/lbs./Year (.0184 tons per reduced mile)	138,112
Reduced NOX/lbs.Year (.04988 tons per reduced mile)	374,404
Reduced ROG/lbs./Year (.0726 tons per reduced mile)	544,943

*U.S. Census, 2000

** Nationally, the mean travel time for bicycle and pedestrian commuters was 14.2 minutes, which translates roughly into a commute distance of about 3.5 miles for bicyclists or a 7 mile round trip. Assume an average of 200-commute days/year bike/walk commute for adult commuters and 100-commute days/year for students.

***Based on U.S. Bureau estimate of total labor force for 2000, increased by 2.4% population growth estimate for 2001.

Commuter Needs

The majority of workers commute by vehicle, 72.7% driving alone traveling approximately 20 minutes (mean travel time of commuters in Imperial Valley – U.S. Census 2000). Other forms of transportation include carpooling (17%), walking (3.7%), or bicycling or other means (1.9%). Since the principal industry in Imperial Valley is agriculture comprising of 35.1% of the work force and the second largest employer is government comprising 21.3% of the work force, it can be assumed that one-half of those who drive 20 minutes or longer are accessing agriculture jobs in the county. It can also be assumed that the remainder commuters live closer to their employment and therefore, installation of bicycle facilities within a 3.5 mile radius from major governmental employers and central city cores would benefit commuters who desire to cycle to work.

Student Needs

Within Imperial Valley, there are thirty-seven elementary schools, seven high schools, six adult schools, and two colleges, Imperial Valley College in Imperial and a satellite campus of San Diego State University, Imperial Valley Campus in Calexico. While trip distance, residential density, and availability of safe facilities can increase these numbers significantly, the demographic characteristics of college students support the development of facilities to serve bicycle travel. Even in urban traffic environments without significant non-motorized infrastructure, bicycling can represent a far greater mode share in college neighborhoods than in surrounding areas.

Recreation Needs

The needs of recreational bicyclists in Imperial County must be understood prior to developing a system or set of improvements. While it is not possible to serve every street and every need, a good plan will integrate recreational needs to the extent possible. The following points summarize recreational needs:

Recreational bicycling in the unincorporated area of Imperial County typically falls into one of three categories:

1. exercise or training,
2. non-work destination such as a park or shopping, or
3. long-distance touring.

Recreational users range from healthy adults to children to senior citizens. Each group has their own abilities, interests, and needs. A direct route may not be as important a factor in selecting a bicycle route. Routes with improved roadway conditions such as a bicycle lane and smooth surface or a separated bicycle path may be the deciding factor. Visual interest, shade, protection from wind, moderate gradients, or other features are also a consideration. People exercising or touring often frequently prefer a loop route rather than having to backtrack. The distance of the loop routes is on the average 25 miles.

As stated above, estimating future trips associated with new bicycle facilities is a process still developing nationally, and relies in large measure on comparisons with other communities that have comprehensive networks for bicyclists and pedestrians. Completion of individual facilities should not be expected to significantly increase general ridership numbers. Rather, connecting routes that link residential neighborhoods with destination points and separate bicycle pathways will result in a noticeable increase in bicycle use.

Growth in non-motorized travel typically entails development of systems of facilities, including appropriately designed roads and traffic systems, separated bicycle paths and trails, provision of safe and secure parking at destinations, transit systems which accommodate bicyclists, and – perhaps most importantly – the development of information, education and enforcement policies and programs which encourage bicycle use within that community.

B. Accident/Safety Analysis

A review of bicycle-related accidents reported in Imperial Valley reveals that the majority of the accidents occur where children congregate — schools and parks. Areas of major concern due to the high numbers of young, inexperienced cyclists, high traffic volumes, and limited visibility are Ross Road/Drew Road at Sunbeam Lake and La Brucherie Road where there has been three accidents, including one fatality (K. Williams, County of Imperial, 12/3/99).

Statistics compiled by the Pedestrian and Bicycle Information Center of the Association of Pedestrian and Bicycle Professionals indicate that bicyclists face only a marginally higher chance of sustaining an injury than motorists based on the numbers of users and miles traveled. Much of the perception of danger comes from motorists who have to veer into an opposing lane of traffic to pass a bicyclist(s) or who must slow down in order to accommodate a bicyclist(s) in the lane of traffic. Motorists are often unaware that bicyclists are permitted to share the road with vehicles. Awareness of the shared use of the road with bicyclists can be promoted through

signs that state “Share the Road” (see Chapter 5, Section B, Bikeway Signage) and through education classes at community groups and driver education programs.

Safety is a major concern for both existing and potential bicyclists. For those who ride, the selection of the route and the ease of utilization is an on-going consideration. For those who don't ride, the hassles of riding are one of the most compelling reasons not to ride.

In discussing bicycle safety, it is important to separate out perceived dangers versus actual safety hazards. Bicycle riding in cities is commonly perceived as at least semi-dangerous because of the exposure of a lightweight, two-wheeled vehicle trying to negotiate in the no-man's land between automobiles, trucks, buses, and pedestrians. In Imperial Valley, this perceived safety hazard is often the reality, there are limited areas with wide shoulders to accommodate an area to ride, there is truck and agriculture traffic on virtually every road, and the speed of the vehicles makes is uncomfortable to ride in the lane of traffic.

In fact, bicyclists face only a marginally higher chance of sustaining an injury than motorists based on the numbers of users and miles traveled. Much of the perception of danger comes from motorists who have to swing into an opposing lane of traffic to pass a bicyclists, or who must slow down in order to accommodate a bicyclist(s) in the lane of traffic. Conversely, almost all bicyclists can tell horror stories about being run off roads by motorists, about near misses, and some not so near misses.

Bicycle safety programs may be offered by individual police departments or at local schools. No programs exist in the County area. Where sidewalks are available, most children are encouraged to ride on the sidewalks. It is evident by the numbers of bicycles at the bike racks of the local schools that many children bike to school. In the unincorporated area of the Imperial Valley, bicyclists ride on the shoulders of the roadways.

Theft and vandalism are an issue for cyclists who bike to parks, schools, and employment centers. The lack of bike racks at parks, employment centers, and retail areas makes it difficult for cyclists to commute to work or shopping. Bicycle racks are not located at County's parks. In areas where cyclists become recognized as a viable source of revenue, bicycle racks are a way of encouraging cycling activity and gaining a clientele. Taco Bell in El Centro installed a bike rack in response to the demands of a local cycle club who meet there regularly to head out on long-distance rides. Retail services and restaurants may find that they can increase revenues by providing bicycle racks and at the same time provide awareness of a growing cycling community.

C. Air Quality Analysis and Health Benefits

Air Quality

The California Clean Air Act (CCAA) of 1988 requires that all areas of the state achieve and maintain ambient air quality standards. The State legislature in order to continue to meet federal mandates of the Clean Air Act of 1970 and subsequent amendments approve amendments to the Act each year. The Air Quality Attainment Plan for Imperial, prepared by the Imperial County Air Pollution Control District in 1991, is designed to meet these requirements. Installing bicycle facilities will encourage bicycling and thereby reduce the use of vehicles and improve air quality.

Imperial Valley is located within the Southeast Desert Air Basin (SEDAB). Exposure to air pollutants has a serious effect on health. Particulate matter is a good indicator of the air pollution mix that people are exposed to and has been associated with short-term and long-term increases in mortality. Particulate Matter (PM) is a complex mixture of solid and fragments and moist liquid found in the air we breathe. These fine particles can be made up of many different materials such as metals, soot, soil and dust. Coarse particles are between 2.5 and 10 microns in diameter.

Several studies have linked proximity to busy roads and heavy goods vehicles (mostly with diesel engines) with respiratory problems. (Occupational Environmental Medicine, 1998 and Epidemiology 1997). Car users have been shown to breathe more air pollutants than walkers, cyclists, or people using public transport on the same road due air pollutants breathed in congested traffic, at drive-thru restaurants and banks, and at intersections.

The Air Resource Board regulates particles of 10 microns or less in diameter (PM10). People exposed to particulate matter have higher risks of respiratory symptoms, greater use of drugs for asthma, and respiratory and cardiovascular disease. Since 1992, the Air Resource Board has participated in cooperative air monitoring efforts in the California – Mexico border region with other regulatory agencies. The objective of the air-monitoring program is the development of a database to assess the causes and severity of pollutants in the region and develop strategies to improve air quality.

Air pollution monitoring stations controlled by the Air Pollution Control District are located in Brawley, El Centro, and Calexico to determine if the County is meeting the national air quality standards. At the present time, according to the local Air Pollution Control District office in El Centro, Imperial Valley is a non-attainment area for PM10 (particulate matter) and ozone. (Air Pollution Control District – El Centro, September 20, 2002).

The combined benefit of these future bicycle commuters over the next 20 years is an annual reduction of about 138,112 lbs. of particulate matter in the air (PM10), and a reduction of 374,404 lbs. of NOx, and 544,943 lbs. of ROG.

Health Benefits

"In 1999, 13% of children aged 6 to 11 years and 14% of adolescents aged 12 to 19 years in the United States were overweight. Overweight or obese adults are at risk for a number of health problems including heart disease, type 2 diabetes, high blood pressure, and some forms of cancer." ("Overweight and Obesity Fact Sheet," Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity). More people are at risk of coronary heart disease due to physical inactivity than any other single risk factor. Low to moderate levels of exercise, such as bicycling can also reduce hypertension, obesity, diabetes, osteoporosis, and depression. As important as measurable health benefits, regular exercise and recreation improves mental outlook and enhances the well being.

The number of bicycling and walking trips has been on a continual decline between 1975 and 1995. The car is used for even the shortest trips – 25% of all trips are less than one mile in length and 75% of those are made by automobile.

The benefits of cycling and walking are frequently overlooked. The increase in obesity follows a decline in walking and bicycling. A study in the December 2001 issue of the American Journal for Public Health cites that communities that build bicycling and walking trails, support exercise programs, and provide public areas, such as parks and sidewalks, can boost physical activity levels. Cycling or walking can bring major health benefits. Thirty minutes for adults and 60 minutes of moderate physical activity such as walking or cycling most days of the week can reduce the risk of developing heart disease by half and maintain normal weight (see www.surgeongeneral.gov). The Office of Communication for the Center for Disease Control and Prevention state that "urban policymakers must provide more sidewalks, bike paths, and other alternatives to cars" in order to encourage physical activity to our daily routines ("Obesity Epidemic Increase Dramatically in the United States: CCDC Director Calls for National Prevention Effort.")

The health and recreational benefits of bicycling can contribute to an increased demand for recreational bicycling facilities for those who regularly migrate to the Imperial Valley for winter residence. Such demand would likely be for separated facilities such as bike paths or trails. Favorable year-round weather combined with available and safe facilities would increase the numbers of active seniors who bicycle periodically, although statistical verification of this is difficult to establish at this time.

D. Education

Non-motorized travel typically entails development of systems of facilities, including appropriately designed roads and traffic systems, separated bicycle paths and trails, provision of safe and secure parking at destinations, transit systems which accommodate bicyclists. Perhaps most importantly, is the development of information, education and enforcement policies and programs, which encourage bicycle use within that community.

Awareness of cyclists serves as an educational component for the safety of cyclists. To promote bicycle safety, other cities have advertised bicycle safety messages on bus billboards, bus benches, park and recreation brochures, local street maps, bumper stickers, school bulletin boards, radio shows, traffic signs, library bulletin boards, and trail kiosks. Promoting annual "Bike-to-Work" Week encourages commuting to work and more importantly recognizes and promotes cycling as a true form of transportation. Improved education of the advantages of cycling and how to cycle correctly and defensively are key to improving cycling in the community.

The National Bicycle and Walking Study noted that as more cyclists are evident on roadways, vehicles are more apt to expect and watch for cyclists. Making bicycling and walking more viable and attractive relies on the "four E's" of cycling as defined by the Federal Highway Administration: **E**ngineering, **E**ducation, **E**nforcement and **E**ncouragement. Each must be optimized into a cohesive strategy to make cycling a reality to the community.

Engineering – Design bicycle facilities to the "best available practices"
Education – Tailor education programs to adult and student bicyclists and to motorists to inform on safe cycling and driving.
Enforcement – Establish routine enforcement measures to enforce rules designed for the safety of the rider.

Encouragement – Offer encouragement that entices would-be cyclists and rewards children cycle effectively and safety.

Safety education programs should target cyclists of all ages and motorists as well. Emphasis should focus on the rules of the road, riding on the street, advantages to using helmets, using lights at night, and selecting appropriate routes for cycling. The purpose of an education program is to reduce bicycle injuries and fatalities and to encourage bicycling as an alternate mode of transportation to motor vehicle travel. An education program aimed at both students and adults which promotes the advantages of cycling and explains how to cycle effectively and defensively are key to improving cycling in the community. Safety education programs should target cyclists of all ages and motorists with emphasis placed on educating cyclists on the rules of the road, riding on the street, advantages to using helmets, using lights at night, and selecting appropriate routes for cycling.

Bicycle safety programs, "Bicycle Rodeos", are regularly conducted by local police departments at elementary and junior high schools. These rodeos may include instruction on the following:

- Helmet use
- Choosing the right bike
- Proper bicycling clothing
- Recognition and avoidance of common bicycling collisions
- Bicycle registration
- Selecting safe bike routes to and from school
- Consequences of unsafe bicycle use
- Bicycle operation, such as braking techniques, use of hand signals, turning techniques, proper mounting and dismounting, maneuvering, and safety precautions

Enacted on October 8, 1993, the State of California Bike Helmet Law requires children under the age of 18 to wear a helmet or a $25.00 fine may be assessed. However, most children do not wear helmets or are not required by their parents to wear helmets while bicycling. The BHSI quotes statistics that wearing a bike helmet can reduce head injury by 85% and prevent three out of four head injury deaths. An effective bicycle helmet campaign can be accomplished economically with donations from bicycle helmet manufacturers and incentives donated from local stores, bowling alleys, miniature golf, and other recreation outlets. The BHSI website at www.bhsi.org also suggests poster contests for children to color helmet posters is an effective method for promoting safe cycling for students.

The Bicycle Helmet Safety Institute (BHSI) encourages communities to conduct safety programs recommending a "Basic Approach" to bike safety. The ideal campaign would include (www.bhsi.org) all of the following components:

- Basic Bicycle Safety Education for Riders
- Helmet Promotion
- Driver Education
- Facility Improvement

National Highway Traffic Safety Administration (NHTSA) is a valuable resource for educational tools on the safety of bicycling such as a peer-to-peer approach video on values of wearing helmets and rules of the road (see www.nhtsa.org). A comprehensive guide, "Resource Guide

on Laws Related to Pedestrian and Bicycle Safety" includes vehicle and traffic laws that may affect pedestrian and bicyclists safety and contains model legislation that is designed to have a positive effect on pedestrian safety.

Additionally, the "Safe Routes to School Program," approved by the State of California in 1999 and extended in 2001, sets aside funds for bicycle safety education and implementation of bicycle facilities.

It is recommended that the County adopts and promotes an education program that would include the following:

1. Support bicycle safety programs and bicycle rodeos at local schools and community centers.
2. Identify a key contact person to coordinate and resolve issues related to cycling.
3. Create and distribute bicycling maps that identify bicycling routes to schools and employment centers, locations of bicycling racks and staging areas, and safety tips.
4. Pursue grant funds for bicycling safety and public awareness programs.
5. Conduct periodic surveys at schools and through community groups and parent teacher associations to identify current bicycling concerns.
6. Promote "Bike to Work" week.
7. Promote bicycling licensing as a way to track-stolen bikes and children involved in accidents.
8. Expand bicycle education with "Share the Road" education programs to local adult organizations.
9. Participate with other jurisdictions to develop and implement bicycle facilities.

Bicycle safety can promote bicycle safety and use by providing messages, announcements and advertisements in appropriate locations. Awareness efforts could include distributing bikeway maps that not only locates bicycle routes, facilities, bicycle racks, staging areas, but offers bicycle safety tips. Other areas that have been used successfully by other cities has been the dissemination of messages on bus billboards, bus benches, park and recreation brochures, local street maps, bumper stickers, school bulletin boards, radio shows, traffic signs, library bulletin boards, and trail kiosks.

Awareness of cyclists serves as an educational component for the safety of cyclists. Promoting "Bike-to-Work" Week encourages commuting to work and more importantly recognizes and promotes cycling as a true transportation mode.

The cycling community would be best served by a bicycle coordinator who has the responsibility to implement this Master Plan and generally promote bicycle usage. This person may perform other tasks that may include:

- Pursing funding sources for bikeway projects and bicycle programs.
- Participate in local bicycle facilities committees and other regional transportation groups involved in funding programs and transportation planning.
- Coordinate and promote bikeway programs, incentives, and awareness events.
- Act as contact person for bikeway issues.
- Review transportation improvement plans to ensure consistency with State standards.
- Participate in the development of the Regional Transportation Plan as it relates to bicycle facilities.

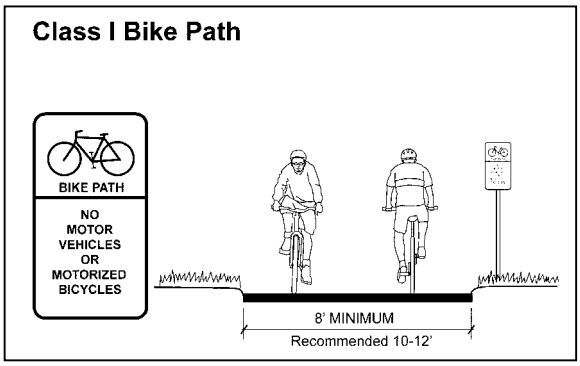
CHAPTER 5 PROPOSED BIKEWAY SYSTEM

Bicyclists are entitled to travel on all roads except those that are lawfully prohibited to them (Cal. Veh. Code § 21200). Many motorists do not know that by law bicyclists on conventional roadways are not required to use a separated path or even a shoulder. There are many cyclists who prefer cycling in the lane of traffic. Like motorists, bicyclists want to reach their destinations safely, conveniently, and with minimum delay. Many bicycle commuters or long distance cyclists avoid bicycle paths due to slower moving bicyclists or pedestrians. Frequently, bicycle paths are not direct or continuous and are used more by recreationists rather than commuters. However, each community is comprised of cyclists of different abilities and those who desire different types of facilities. All three bike facilities described below, Class I bike paths, Class II bike lanes, and Class III bicycle routes serve different purposes and user groups. Each community should offer facilities that meet these varied needs.

A. Classifications

Design standards for bikeways have been established by American Association of Highway and Transportation Officials (AASHTO) and the California Department of Transportation (Caltrans). In California, all new bikeways should meet or exceed Caltrans guidelines as described in the "Caltrans Highway Design Manual, Chapter 1000, Bikeway Planning and Design" found in Appendix D. The manual establishes uniform policies and procedures to carry out the highway design functions of Caltrans. Bicycle projects receiving grants through Caltrans must meet the design standards of Chapter 1000. Planning of bikeways should concentrate on providing the highest level of safety for bicyclists and motorists alike.

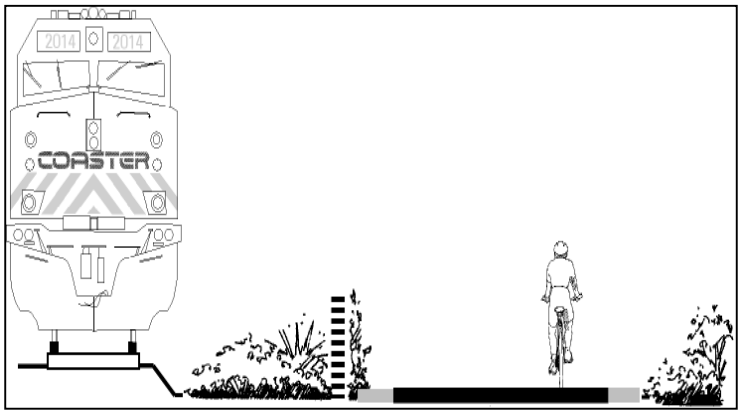
Class I – Bike Paths



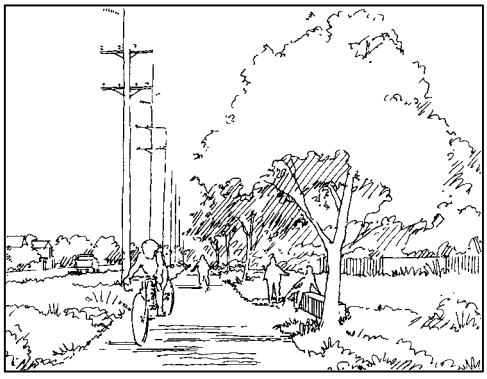
Class I bikeways are facilities where exclusive right of way with cross-vehicular traffic is minimized. Class I bikeways serve the exclusive use of bicycles and pedestrians and are not shared by motor vehicles except for maintenance, security or emergencies. The minimum paved width for a two way bike path is 2.4 m. (8 ft.). The minimum paved width for a one way bike path is 1.5 m. (5 ft.). A bicycle path is not a sidewalk but typically allows shared use with pedestrians, rollerbladers and/or skateboarders. Although the Caltrans standard requires a smooth paved surface, other communities are discovering that there is a broader interest for hiking or mountain biking along a more natural terrain. Decomposed granite or a soil stabilized surface treatment is relatively inexpensive in comparison with hard-surface trails, and these trails offer an alternative to smooth surface trails. Additionally, the soil stabilized project may be tinted to blend with the natural terrain and it allows water runoff to be absorbed that than flow into the sewer systems.

It is recommended that along Class I bike paths landscaping be drought tolerant and low maintenance species. A Class I bicycle path along the railroad or the All American Canal would remain consistent with the Class I Bike Path as depicted below.

The graphic to the right reflects a proposed bicycle path along the coast in San Diego County, known as the Coastal Rail Trail. A 12' wide bicycle path is planned to be located within the railroad right-of-way, separated from the railroad by a 4' - 5' high fence and landscaping. This multi-use pathway will serve bicycling commuters and recreationists as it will link to transit stations, commercial businesses, and beach access points along the corridor.



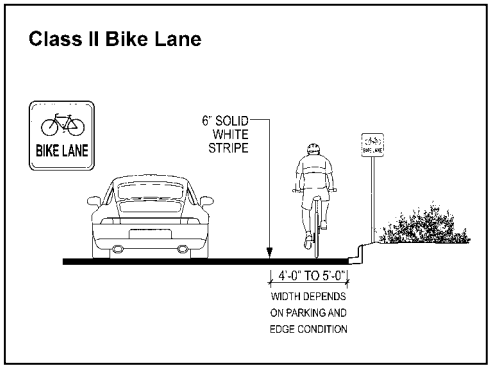
The Imperial County recommended bicycle network includes three Class I pathways: along the canal that borders the eastern and northern portion of the city (Route 10), along Aten Road connecting the city of Imperial to Imperial Valley College (Route 9), and along the an abandoned railway from Holtville to El Centro to the community of Seeley (Route 12). A similar path is proposed in the City of El Centro along La Brucherie Road, above the underground irrigation canal. A conceptual design for an 8' – 10' wide Class I bicycle path reflects a path within a landscaped corridor as shown below.



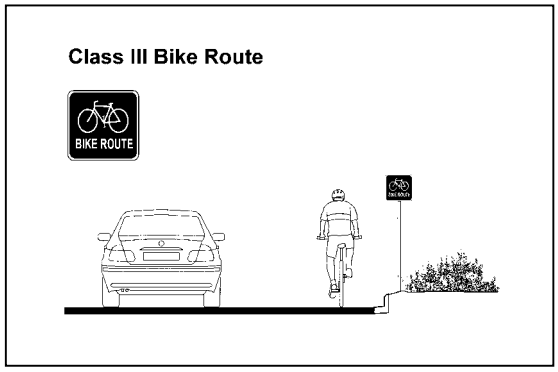
Class II - Bicycle Lanes

Class II bikeways (bike lanes) for preferential use by bicyclists is established within the paved area of roadways adjacent to vehicle lanes through identifiable pavement striping and markings and signage.

Caltrans recommends that Class II bicycle lanes use a minimum 1.2 m. (4 ft.) paved roadway shoulders with a standard 100 mm. (4 in.) edge stripe to improve the safety and convenience for bicyclists and motorists (Section 1002.4(1)).



Class III - Bicycle Routes



Class III bikeways (bike routes) are intended to provide continuity to the bikeway system. Bike routes are established along through routes not served by Class I or II bikeways, or to connect discontinuous segments of bikeway (normally bike lanes) where there is not adequate width to install bike lanes.

Class III facilities are shared facilities, either with motor vehicles on the street or with pedestrians on sidewalks. In either case, bicycle usage is secondary. Class III facilities are established by placing bike route signs along roadways.

B. Bikeway Signage

Many standard roadway signs, such as speed limit and warning signs, apply to both motorists and bicyclists. Additional signs specifically designated for bike facilities should conform to the Caltrans Highway Design Manual and/or the Manual on Uniform Traffic Control Devices (MUTCD). Caltrans Highway Design Manual, Chapter 1000 (see Appendix D) require that bikeways include standard signs and pavement markings as shown. The MUTCD defines standards used by road managers nationwide to install and maintain traffic control devices on all streets and highways.

Standard regulatory, warning, and guide signs used on highways may be used on Class I bike paths, as appropriate.

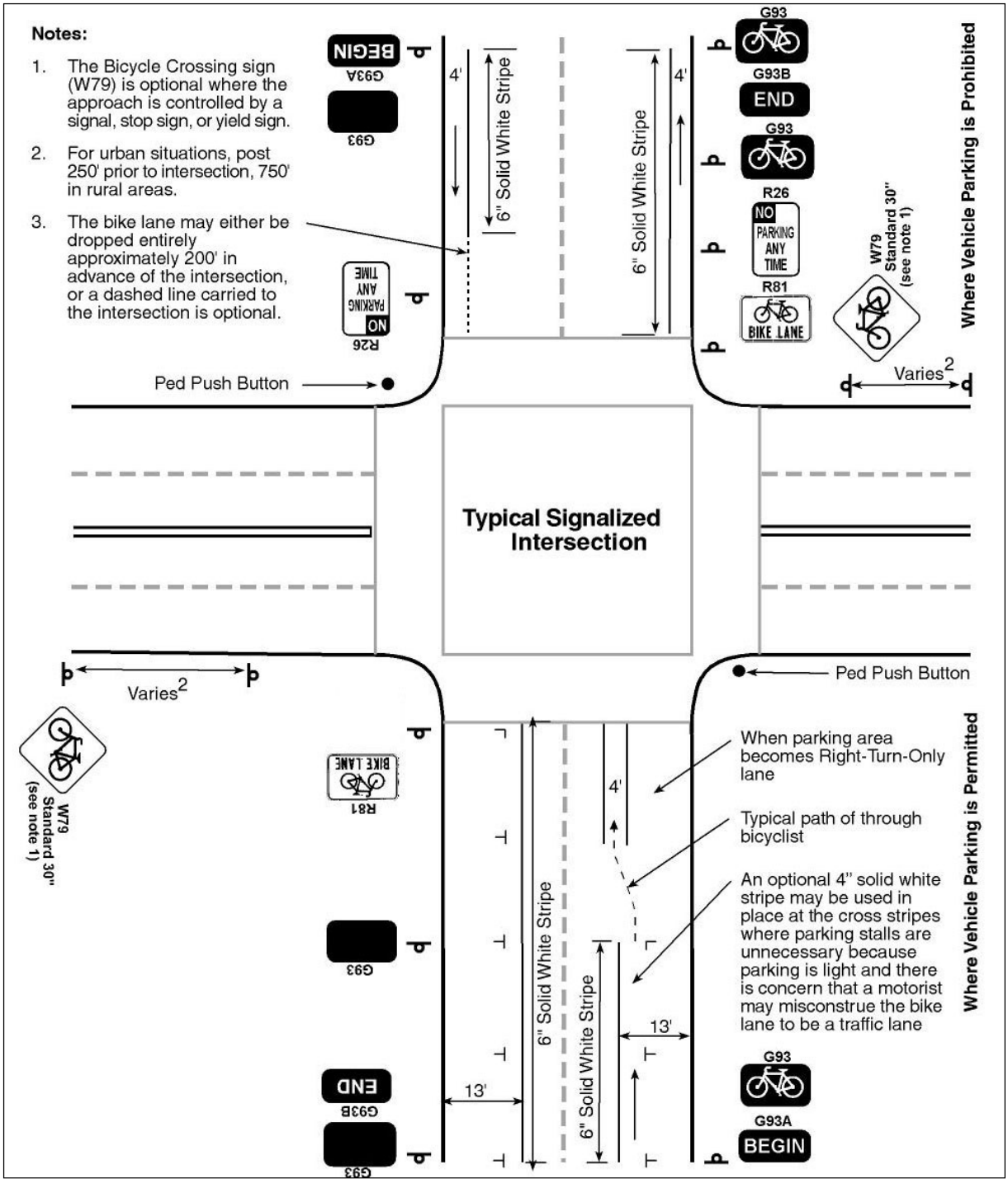
The bike lane sign shall be placed at the beginning of all bike lanes, on the far side of every arterial street intersection, at all major changes in direction, and at maximum 1-km intervals. Bike routes are established through placement of the bike route sign. Bike route signs are to be placed periodically along the route.

In order to create continuity and identity of the bicycle system, a comprehensive sign program utilizes an identifiable logo or County seal that may be attached to the bike signs. This identifiable logo can help build support, recognition and

awareness of the bikeway system and increase the number of cyclists. This identity would be used on all bikeway signage, brochures, and other materials. The logo will help define the bikeway facilities as a cohesive system rather than a series of disconnected segments. A City-wide numbering system may also be used that would identify bikeways to enable cyclists to plan a route or note where support facilities are located.

Since bicyclists may use any roadway in the State of California unless specifically restricted otherwise, advising motorists that bicyclists may use the road not only provides a visual awareness for motorists to expect bicyclists. Installing the “Share the Road” signs on roadways where bicyclists are frequently seen as well in areas where there may have been conflicts with bicyclists and vehicles, helps with the awareness.

The next page provides guidance for locating signage at intersections.


Notes:
1. The Bicycle Crossing sign (W79) is optional where the approach is controlled by a signal, stop sign, or yield sign.
2. For urban situations, post 250' prior to intersection, 750' in rural areas.
3. The bike lane may either be dropped entirely approximately 200' in advance of the intersection, or a dashed line carried to the intersection is optional.
BEGIN
G93A
G93
4'
6" Solid White Stripe
6" Solid White Stripe
4'
G93
G93B
END
G93
R26
NO PARKING ANY TIME
R81
BIKE LANE
W79 Standard 30" (see note 1)
Where Vehicle Parking is Prohibited
R26
NO PARKING ANY TIME
Ped Push Button
Varies2
Typical Signalized Intersection
Varies2
Ped Push Button
W79 Standard 30" (see note 1)
R81
BIKE LANE
When parking area becomes Right-Turn-Only lane
Typical path of through bicyclist
An optional 4" solid white stripe may be used in place at the cross stripes where parking stalls are unnecessary because parking is light and there is concern that a motorist may misconstrue the bike lane to be a traffic lane
Where Vehicle Parking is Permitted
4'
6" Solid White Stripe
6" Solid White Stripe
13'
13'
G93
END
G93B
G93
G93
G93A
BEGIN

C. Support Facilities

Support facilities and programs are an important part of any bikeway system. Support facilities may include bicycle parking (bike racks or lockers), showers for commuters, and staging areas.

Bicycle Parking
Bicycle parking may be separated into two categories: Short term parking and long-term parking. Short-term bicycle parking is usually defined as being two hours or less and consists of a bicycle rack or series of bicycle racks. Whereas long-term parking suggests that bicyclists may leave the bike all day, overnight, or for a longer duration. Long-term parking options include:

- Lockers, individual lockers for one or two bicycles
- Racks in an enclosed, lockable room or fenced area
- Racks in an area monitored by security (cameras, guards, or other personnel)
- Racks or lockers in an area always visible to employees.

Lack of bike racks and other facilities are frequently mentioned by bicyclists and would-be bicyclists as reasons why they don't ride or ride less often. Bike racks are located at each of the schools, but not at the County parks or at any of the key employment centers. Other major employment areas should consider installing bike racks. The fear of bicycle theft is a significant deterrent to bicycle use.

To further encourage bicycling, the County should adopt bicycle-parking standards for future commercial and industrial development. Typical standards are one bicycle rack (10 bicycles) per 40 elementary and junior high schools students, per 100 high school students, and per 100 employees. The number of racks needed at each location can be determined when the existing rack begins to exceed 80% capacity.

Heavy bicycle use is the primary reason for locating bicycling racks. Standard locations are schools and parks. Other determinants for siting bike parking are:

- Visual observation – observe where bikes are illegally parked due to lack of bicycle racks.
- User Input – ask bicyclists and bike groups.
- Land use criteria – target areas where people gather such as coffee shops, bookstores, recreation centers (miniature golf, video arcade, and transit stations, and areas around the border crossings.)
- Zoning code – require new commercial development and change in business to install bike parking proportionate to car parking requirements. Bike racks should be located at each school and at shopping areas in excess of 50,000 square feet or where it is evident of high cycling use (such as the downtown retail center).

Racks should either be installed in the public right-of-way, at schools and parks, or at commercial and industrial sites in conformance with setback requirements. Bike racks should be located based on the following:

- Visibility – Cyclists should be able to easily spot bicycle racks from the street.
- Access – Bicycle racks should be convenient to building entrances and street access. Whenever possible, racks should be placed within 50 feet of building entrances.
- Security – Locate parking within view of pedestrians, shops, or office windows or within a fenced area for long-term parking such as at a school.
- Lighting - To avoid theft, bicycle-parking areas should be located within a well-lighted area.
- Weather protection – Whenever possible protect the bicycle-parking area from weather by siting under an existing overhand or covered walkway.
- Avoid conflict with pedestrians or vehicles– Locate racks so that parked bicycles do not block walkways or vehicle parking.

The design of the rack should:

- Support the bike frame at two locations (not just the wheel)
- Allow both the frame and at least one wheel to be locked to the rack (without requiring that the lock be placed near the bicycle chain)
- Allow the use of either a cable or "U-type" lock
- Allow bicycles which are equipped with water bottle cages, or not equipped with kickstands
- Accommodate all types of size of bicycles, including various types of and sizes of frames, wheel sizes, and tire widths

Three common ways of providing secure long-term bicycle parking are:

1. Enclosed bicycle lockers accessible only by the user,
2. Regularly patrolled facility, and
3. Restricted access to facilities where only bicycles owners are permitted access to the area.

Transit stations or major employment locations frequently provide bicycle lockers. Daily or monthly rent varies from one agency to another. A survey conducted by Pedestrian and Bicycling Information Center revealed a low rental of $2.00 per month (Tucson, AZ), to a mid-range of $5.00 per month (Santa Cruz, CA and Caltrain), to a high end rental of $10.00 per month in Portland, Oregon.

Shower Facilities

Cyclists may be more apt to commute by bicyclist to their place of employment, if shower facilities are offered or readily available at nearby fitness centers or gymnasiums. Some employers who typically offer shower facilities are fire stations or police stations or college gyms. The County should encourage new employers to provide shower facilities for their employers.

Staging Areas

Other support facilities may include staging areas at key locations where it is anticipated to have a high usage or if the facility is located a long distance from where cyclists may start their rides. These staging areas may include a number of other amenities including:

- Bike racks
- Shade shelters
- Benches and/or picnic tables
- Signage (interpretative and directional)
- Lighting
- Trash receptacles
- Emergency telephones
- Restrooms or portable restrooms
- Water fountains (with bottle spouts and dog basins)

Class I bike paths frequently include support facilities such as lighting, signing, water fountains, and interpretative signing. Since the number of users are frequently higher than a Class II or III and the type of users include not only cyclists, but pedestrians, disabled persons, and roller bladers, additional support facilities are warranted. Loop detectors designed for the purpose of detecting bicycles waiting at signalized intersections should be installed at intersections with bicycle lanes as part of roadway expansion or reconstruction projects.

CHAPTER 6 BIKEWAY PLAN

A. Route Selection

Most streets and highways without bikeway designations permit bicycle travel, however it may be desirable to place bike route (Class III) designations on those roadways. In areas of limited width and high traffic volumes or speeds, the use of the roadway may be unacceptable to most cyclists creating a perception of decreased safety. Roadways, which could easily accommodate Class II bike lanes by signing and striping and minor improvements were considered for, bike lanes. Improvements such as additional asphalt paving, striping and signing (Class II) would improve roadway conditions for bicyclists. Additional considerations were for recommending a route include those roadways, which connect to schools, employment centers, and/or parks. The choice of whether the bicycle facility should be a Class I, II, or III is dependent on many factors.

1. Directness to schools, employment centers, or attractions
2. Roadway conditions
3. Traffic volumes and speeds
4. Continuity
5. Access
6. Attractiveness
7. Security
10. Elimination of barriers that restrict bicycle travel
11. Delays
12. Conflicts

Based on the key goals, recommendations presented during the two public workshops, and upon conducting visual site surveys, a system of proposed bikeway routes was developed. Some general principles should guide the bicycle facilities planning process:

1. Every street is a bicycling street and all locations accessible to a motor vehicle should be accessible by bike.
2. All appropriate agencies and general public should be involved in the planning process.
3. Transportation plans should overcome existing barriers to bicycle travel, create no new barriers, and encourage new bicycling facilities.
4. Roadway improvements should provide access to all destinations through the most direct or feasible route.
5. The plan should remain flexible and anticipate changes to the system as the City grows and community facilities, schools, and employment centers are established.

Plan Review and Update

Once adopted, the plan should be updated every four years as required by Caltrans for grant programs. The update should include an assessment of the successes of completed facilities, an appraisal of cost estimates based on current construction fees, and modification to the bicycle network to respond to community interests for bicycle facilities and for proposed new development. Additional routes would be subject to additional environmental review.

B. Proposed Bikeway System

Based on the key goals, information collected during the public workshop, and upon conducting visual site surveys, a system of proposed bikeway routes were developed. Field review revealed a number of potential problems as well as opportunities for bicycle facilities. These problems include:

1. Roadway right-of-way is generally 80 - 100' wide although the paving is considerably less with asphalt generally extending 22' - 24' to 30' wide allowing for the movement of two way traffic,
2. High volumes of truck and agriculture equipment moving on the roadways,
3. Roadways bordered by dirt drainage channels, and
4. Asphalt pavement in poor condition.

Other opportunities for bikeways exist which include:

1. Large blocks of intensive agriculture which extend for a mile or more so that there is minimal cross traffic,
2. Limited traffic on many roadways,
3. Roadways with a wider width allowing for a breakdown lane,
4. System of canals operated by the Imperial Irrigation District that supplies irrigation water throughout the County. Formal biking trails and coordinated management of these trails could reduce the unauthorized fishing and hazards posed by the canals. These separated bikeways would provide an opportunity for all ages and abilities to bike, walk, roller blade, and/or use a wheelchair along a scenic corridor.

The 252-mile proposed bikeway system consists of bike routes, lanes and paths. (Figure 2.0) A total of 10 different routes were selected, providing a broad range of coverage and connecting to major destinations. Of the 252 miles proposed, 42 miles are Class I bike paths and the remaining 210 are Class II bike lanes. Class III bike routes (bike route signs) may be installed in the interim until funding becomes available for implementing Class II bike lanes.

The Imperial Valley bicycle system was developed at the September 30, 1999 workshop conducted by the County. The planning and route design methodology began at the workshop with the participants identifying logical routes throughout the Valley for recreational riders, students, and commuters.

Next, each proposed route was evaluated to ensure that the following general standards were met:

1. Coverage - The system should provide equitable, reasonable access from all portions of Imperial Valley to both commuting and recreation routes.

2. System Rationale - Each route in the system should serve a definitive purpose (recreation connection, or commuting) so those users will understand and use the facilities.

3. Regional Bike System - The bikeway system should have good connections to existing and proposed bikeways in the adjacent cities and provide potential routes to schools and employment centers within the cities.

4. Loop Systems - The cyclists in Imperial Valley frequently cycle for exercise, cycling 25+ miles. Recreation bikeway loops should be provided so those cyclists can ride without having to cross major roadways or double back to their destination.

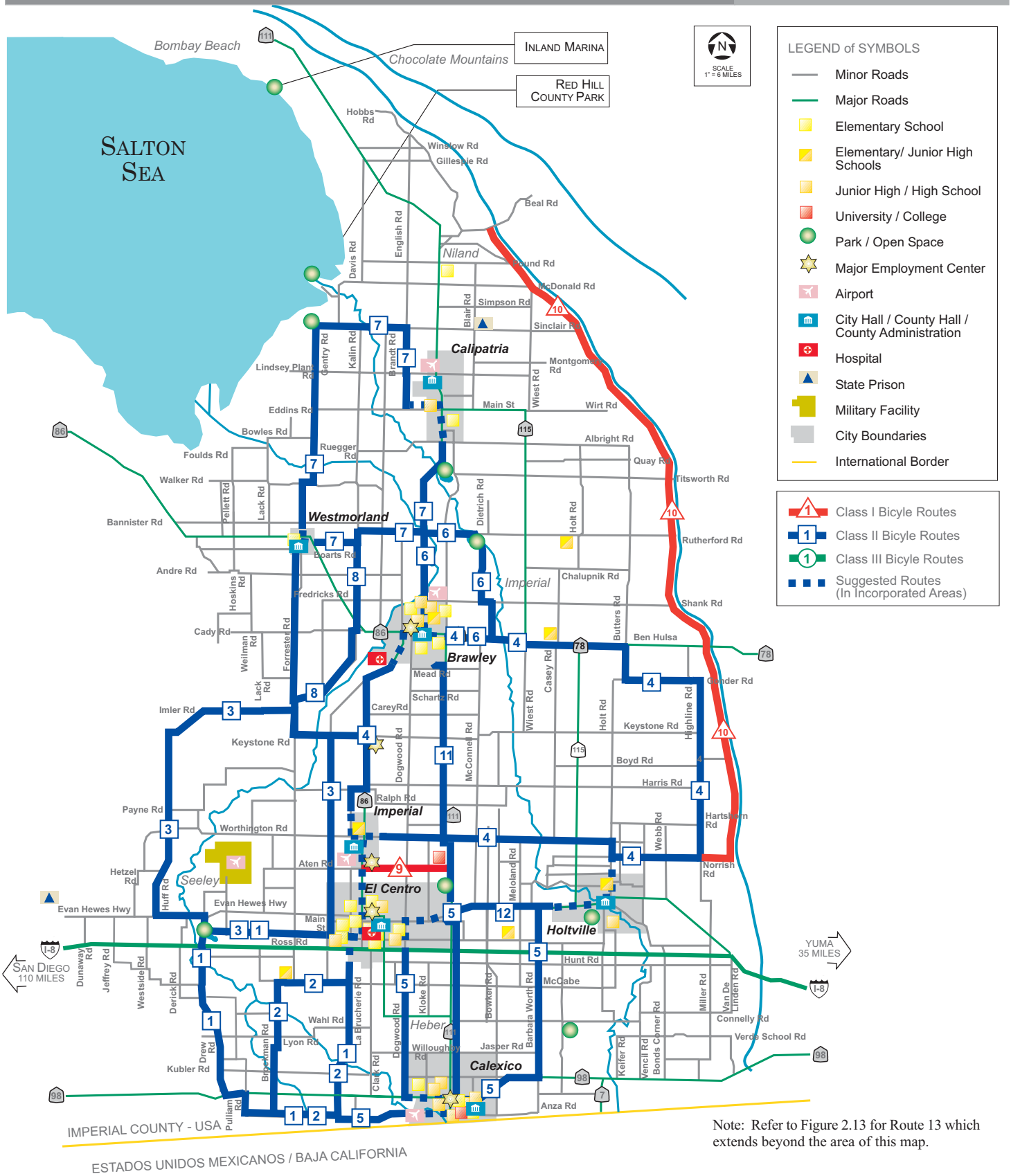
The proposed Imperial Valley Bikeway system consists of 12 routes that appeal to various user groups. Each of the routes offers a loop for recreationists that want to cycle long distances and loop back to the point of origin. The routes also offer connections to schools, employment centers and parks. The County will implement the bicycle system over a period of time. The order in which the routes are presented is not related to level of importance but more in a south to north order. For the most part, all segments have a relatively equal importance and should be implemented based on the following criteria:

1. An opportunity, such as a road widening or repaving, making implementation favorable and economical. Often times, bike improvements can be funded and coordinated to coincide with roadway improvements.
2. An eminent loss of an opportunity, such as sale of a railroad right-of-way or an easement.
3. Availability of funding sources with specific criteria and time limits;
4. Resolution of major obstacle, such as access to privately owned rights of way; and or
5. The segment severs as a critical connection link for other portions of the system.

Route Descriptions

Figures 2.0 shows the recommended bikeway routes for Imperial Valley. Class II bicycle lanes are recommended for routes 1 through 8 and 13. Where there is adequate pavement to accommodate bicycles at this time, interim measures may include Class III bicycle route signage. When funds are available striping and pavement striping to Class II Caltrans standards is recommended. Class 1 bicycle paths are recommended for routes 9, 10 and 12

Imperial Valley Proposed Bicycle Network



Note: Refer to Figure 2.13 for Route 13 which extends beyond the area of this map.

Route 1. Ross Road/ La Brucherie/ Drew Road

Construction Costs:	$1,596,500
Length	24.7 Miles
Characteristics:	
Arterial Crossings	8
Schools	2
Parks	1
Employment Centers	0

This 28.5 mile Class II bicycle route will begin at the western edge of the City of El Centro along Ross Road proceeding to Sunbeam Lake, a distance of 6.5 miles. At Drew Road the bicycle lane would proceed south to Anza Road a distance of 10 miles. At Anza road and Drew Road, the route would proceed easterly towards the City of Calexico along Anza Road to La Brucherie Road, a distance of 4 miles. The route would turn north and continue to the City of El Centro, a distance of 8 miles. The bicycle route would provide connections to the employment centers in El Centro, Southwest High School and De Anza Elementary School, and Sunbeam Lake and BMX Track. It is anticipated that .2 miles would require only bike signs and striping. The balance of the route would require pavement, striping and signs. (See Figure 2.1)

Route 2. McCabe Road/ Brockman/ La Brucherie Road

Construction Cost:	$1,170,000
Length	18.4
miles	
Characteristics:	
Arterial Crossings	8
Schools	1
Parks	0
Employment Centers	0

Beginning at La Brucherie Road and McCabe Road, south of Interstate 8, this bicycle lane would proceed westerly along McCabe Road a distance of 3.6 miles to Brockman Road. At Brockman Road, the bicycle route would head southerly towards the Mexican border, a distance of 6 miles. At Anza Road, the route would continue easterly for 3.6 miles then head north on La Brucherie to the point of origin for 4.4 miles. The total route is 18.4 miles and provides access to McCabe High School. (See Figure 2.2)

Route 3. Austin/Imler Road/ Huff Road/ Ross Road

Construction Cost:	$2,067,000
Length	31.8 miles
Characteristics:	
Arterial Crossings	8
Schools	3
Parks	1
Employment Centers	3

From Austin Road at Ross Road, the bicycle lane would proceed northerly for a distance of 10 miles to Keystone road to Forrester Road. The route would head north on Forrester Road for a short distance, then connect to Imler Road. At Imler Road, the route would proceed easterly to Huff road for 5.5 miles. At Huff Road, the route would traverse southerly to the community of Seeley approximately 10 miles. At Seeley, the route would continue easterly to the point of origin for a total distance of 33 miles. The route would provide connections to the town of Seeley, the City of El Centro, the U.S. Naval Air Station and Sunbeam Lake Community Park and BMX facilities. (See Figure 2.3)

Route 4. Worthington Road/ Highline Road/ Ben Hulsa

Beginning at the Brawley City border this route would proceed easterly along Ben Hulsa jogging to Highline Road, a distance of 15 miles. Heading southerly the trail would proceed for 8 miles along Highline Road to Norrish Road where it would head westerly. Proceeding from Norrish Road and jogging to Worthington Road, the trail will connect to La Brucherie, a distance of 15.8 miles. Heading north along La Brucherie the trail would connect back to the border of Brawley at a distance of 7 miles. The route would connect to 3 employment centers including the City of Brawley, Imperial School complex and the Witter, Hildalgo, and Pine Elementary School. (See Figure 2.4)

Construction Cost:	$3,172,000
Length	48.8 miles
Characteristics:	
Arterial Crossings	8
Schools	6
Parks	2
Employment Centers	3

Route 5. El Centro / Barbara Worth Road/ Calexico/ Dogwood Road

Beginning at the border of El Centro, a bicycle lane would proceed easterly along Evan Hewes Highway to Barbara Worth Road, a distance of 6 miles. At Barbara Worth Road the route would head south for 7.6 miles intersecting at Cole Road where it would connect through Calexico a distance of 6.4 miles. At Dogwood Road, the route would head north to El Centro a total of 7.9 miles. The total route is 31.9 miles of which 14.3 is within incorporated boundaries. The segment within the County of Imperial is 17.6 miles at an estimated cost of $352,000. The total route would connect to 12 schools, local city parks and two major employment areas, El Centro and Calexico. (See Figure 2.5)

Construction Cost:	$1,144,000
Length	31.9 miles
(17.6 miles within the County)	
Characteristics:	
Arterial Crossings	8
Schools	12
Parks	2
Employment Centers	2

Route 6. Weist Lake Park Loop

This route would provide bicycle lanes to Weist Park, a County park offering areas for picnicking and a lake for fishing. Beginning at Weist Park, the route would proceed north on SR111 to Rutherford Road then west to Dogwood Road. At Dogwood Road, the route would continue south to Ben Hulsa Highway. The route connects to six schools in Brawley, an employment center, city hall, and Weist Park. The total distance is 15 miles of which approximately 4 miles are located within the City of Brawley. (See Figure 2.6)

Construction Cost:	$715,000
Length	15 miles
(11 miles within the County)	
Characteristics:	
Arterial Crossings	5
Schools	6
Parks	2
Employment Centers	2

Route 7. Sinclair/Gentry/Rutherford/ SR 111

Construction Cost:	$1,241,500
Length 29.8 miles	
(22.7 miles within the County)	
Characteristics:	
Arterial Crossings	12
Schools	3
Parks	2
Employment Centers	2

Beginning at Sinclair Road, north of Calipatria, the route would traverse west to Gentry Road a distance of 29.7 miles. The bicycle lane would continue south along Gentry Road to Rutherford Road, a distance of 9.6 miles. At Rutherford Road, the trail would continue east through Westmorland to SR 111 and then head north to Calipatria. The total route is 29.8 miles of which approximately 7 miles are located within the Cities of Calipatria and Westmorland. The route would provide connections to Westmorland Union Elementary School, Fremont Elementary School and Calipatria High School, and 2 employment centers in Westmorland and Calipatria. It is anticipated that 5.2 miles of this route will require minor surface repair, signs and striping only. 17.6 miles will require additional pavement, signs and striping.

An extension of this route from Westmorland would include a bicycle lane along Forrestor Road to Imler Road, Connecting to Route 3 and Route 8. (See Figure 2.7)

Route 8. Kalin Road - Connection to Route 3, 4 and 7

Construction Cost:	$598,000
Length -Class II bicycle lane	9.2 miles
Characteristics:	
Arterial Crossings	6
Schools	0
Parks	0
Employment Centers	0

A bicycle lane along Austin Road from the City of Westmorland would provide connections from Route 3 to Route 7. The Class II bike lane connection would begin at Boarts Road and Kalin Road and would proceed southwesterly to Imler Road where it would connect to Route 3 and Route 4. The total distance is 9.2 miles providing connections to Westmorland. (See Figure 2.8)

Route 9. Imperial Valley College

Construction Cost:	$247,000
Length	3.8 miles
Characteristics:	
Arterial Crossings	2
Schools	1
Parks	1
Employment Centers	1

A nonconforming bicycle path is currently located along Aten Road at the southern border of Imperial Valley College. The proposed improvements would include widening the existing pathway to a standard Class I bicycle path and connect from SR 111 to SR 86 a distance of 3.8 miles. (See Figure 2.9)

Route 10. Highline Canal

A scenic bicycle path is proposed along the Highline Canal from the community of Niland at the north end of Imperial Valley to Norrish Road, just north of Holtville. The total distance of the pathway would be 31.2 miles. The anticipated cost to construct an 8' wide pathway constructed of Road Oyl is $1,879,000. The project should be phased in 3 phases. The first phase would connect to Route 4 at Norris Road and at Gunder Road. Phase 2 would start at Gunder Road and connect to Titsworth Road. Phase 3 would continue north from Titsworth Road to Sinclair Road. Phase 4, the final phase would continue north to Niland. The project may be further enhanced with landscaping and staging areas. (Figure 2.10)

Construction Cost:	$2,028,000
Length	31.2 miles
Characteristics:	
Arterial Crossings	0
Schools	0
Parks	0
Employment Centers	0

Route 11 SR 111 from Calexico to Calipatria

This route will provide a direct link from Calexico to Calipatria. Traffic on this roadway moves rapidly, but there is a wide shoulder that could be expanded to provide a wide bicycle lane. This facility would be used by avid cyclists in the valley and long distance cyclists for training. The City of Imperial proposes a Class I bicycle path along the west side of SR 111 through the city to provide a multi-use pathway connecting to services and employment in El Centro. The link is approximately 6 miles long. (See Figure 2.11)

Construction Cost:	$390,000
Length	6 miles
Characteristics:	
Arterial Crossings	8
Schools	1
Parks	1
Employment Centers	2

Route 12 Railway Multi-use Pathway

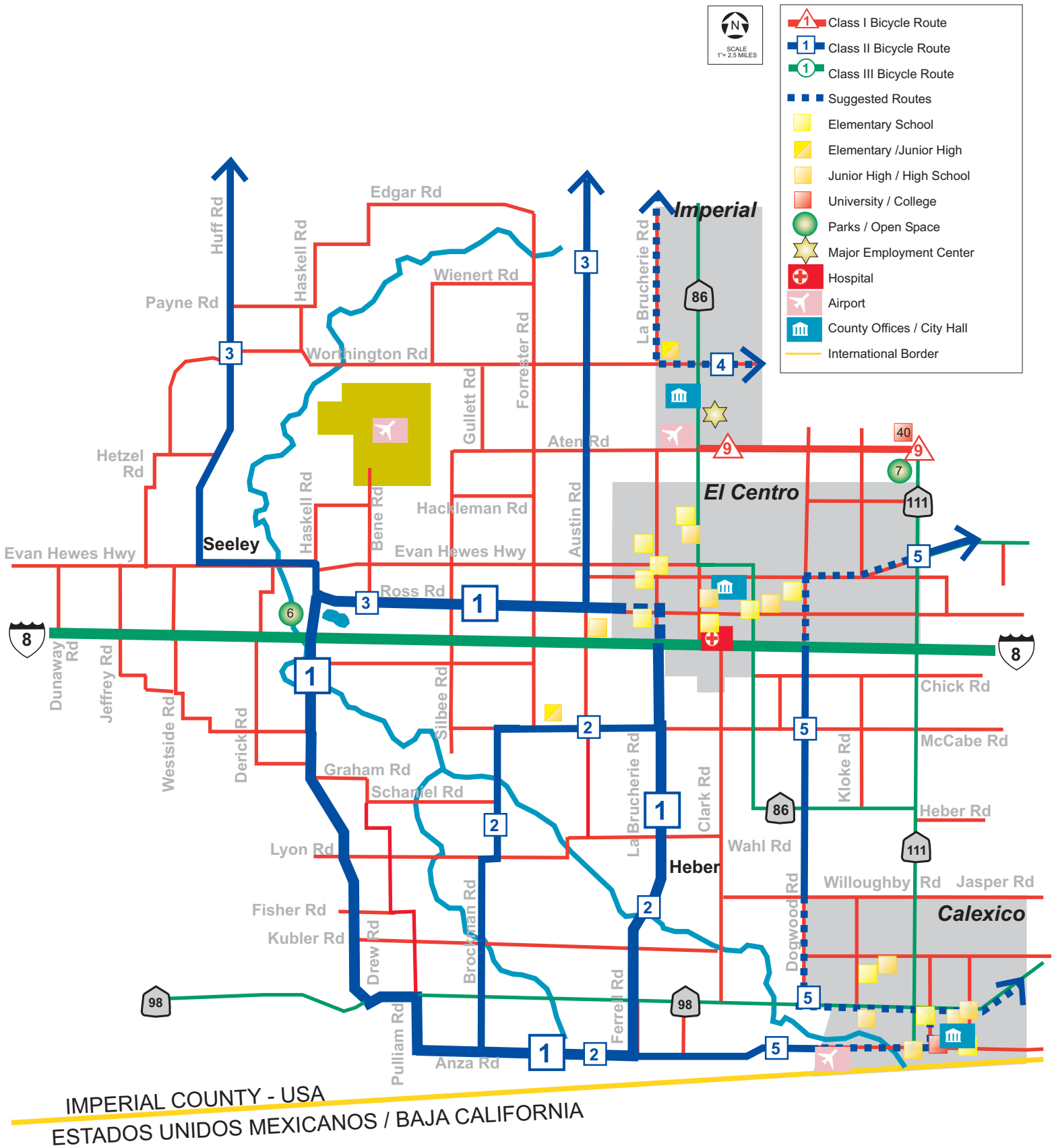
An abandoned railway extends from Holtville, bordering Evan Hewes Highway through the city of El Centro and to the community of Seeley. A bicycle path is proposed along the railway within the City of Holtville. Extending the bicycle path within the County, connecting to bicycle lanes within the City of El Centro, and then utilizing the railroad right-of-way to Seeley would provide a multi-use pathway connecting to downtown El Centro, El Centro Air Station, and the Sunbeam Lake (See Figure 2.12).

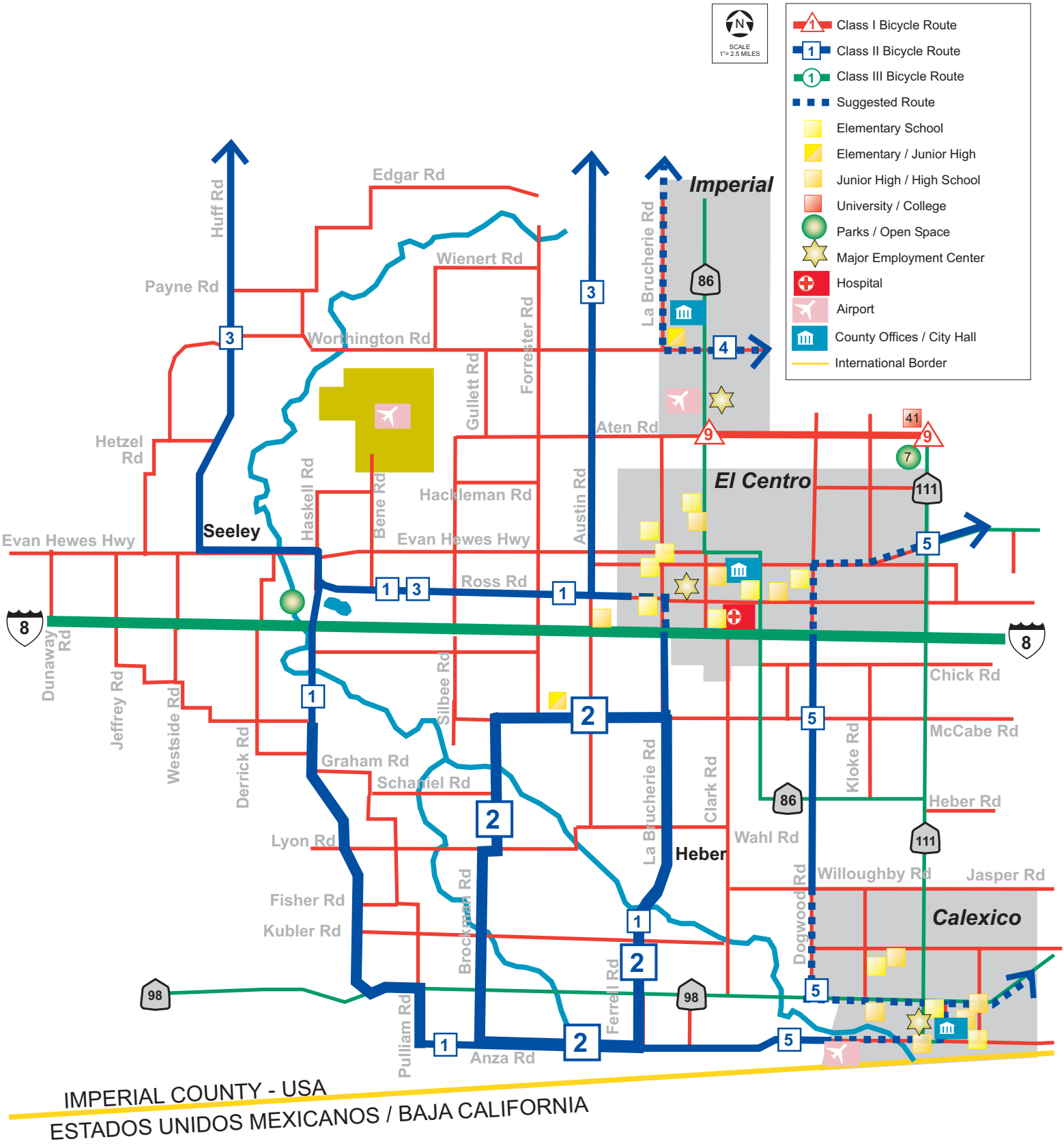
Construction Cost:	$900,000
Length	6 miles
Characteristics:	
Arterial Crossings	3
Schools	0
Parks	0
Employment Centers	3

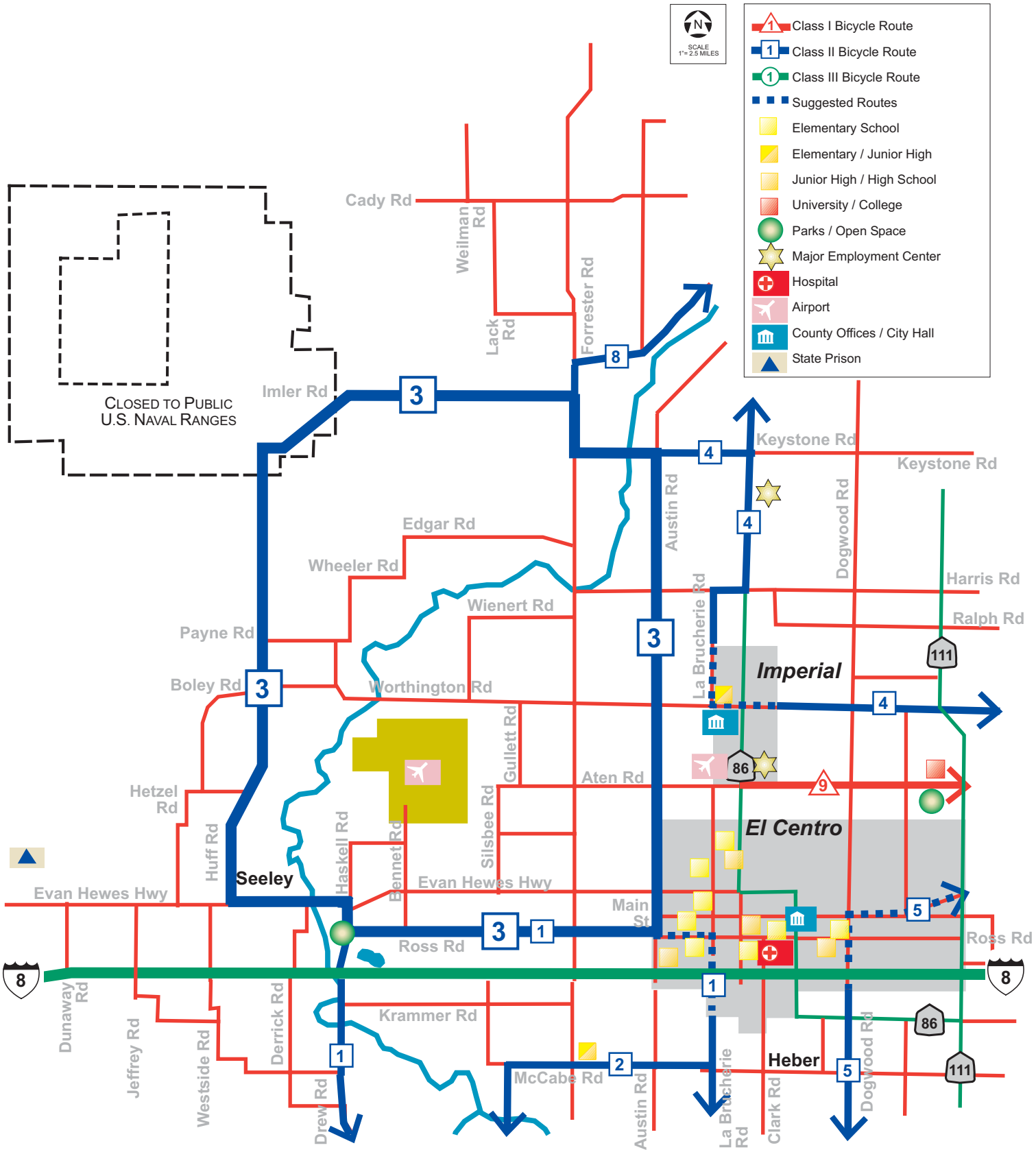
Route 13 Ocotillo Community Park

A Class II bicycle lane would extend from downtown Ocotillo at Interstate 8 along Imperial Highway to the Ocotillo Community Park. Although this bicycle lane does not provide a connection to other regional bicycle facilities it will link the town center to the park. Currently, there is not adequate width along this two-lane roadway to provide a bicycle lane.

Construction Cost:	$97,500
Length	1.5 miles
Characteristics:	
Arterial Crossings	0
Schools	0
Parks	1
Employment Centers	0


SCALE
1"= 2.5 MILES
Class I Bicycle Route
Class II Bicycle Route
Class III Bicycle Route
Suggested Routes
Elementary School
Elementary /Junior High
Junior High / High School
University / College
Parks / Open Space
Major Employment Center
Hospital
Airport
County Offices / City Hall
International Border
Imperial
El Centro
Seeley
Heber
Calexico
Edgar Rd
Huff Rd
Haskell Rd
Wienert Rd
Payne Rd
Worthington Rd
Forrester Rd
La Brucherie Rd
Gullett Rd
Aten Rd
Hetzel Rd
Bene Rd
Hackleman Rd
Austin Rd
Evan Hewes Hwy
Ross Rd
Dunaway Rd
Jeffrey Rd
Westside Rd
Derick Rd
Silbee Rd
Graham Rd
Schaniel Rd
Clark Rd
Kloke Rd
Chick Rd
McCabe Rd
Heber Rd
Wahl Rd
Lyon Rd
Willoughby Rd
Jasper Rd
Dogwood Rd
Fisher Rd
Kubler Rd
Drew Rd
Brockman Rd
Ferrell Rd
Pulliam Rd
Anza Rd
IMPERIAL COUNTY - USA
ESTADOS UNIDOS MEXICANOS / BAJA CALIFORNIA


SCALE
1"= 2.5 MILES
Class I Bicycle Route
Class II Bicycle Route
Class III Bicycle Route
Suggested Route
Elementary School
Elementary / Junior High
Junior High / High School
University / College
Parks / Open Space
Major Employment Center
Hospital
Airport
County Offices / City Hall
International Border
Imperial
El Centro
Seeley
Heber
Calexico
Edgar Rd
Huff Rd
Payne Rd
Wienert Rd
Worthington Rd
Forrester Rd
Gullett Rd
La Brucherie Rd
Aten Rd
Hetzel Rd
Haskell Rd
Bene Rd
Hackleman Rd
Austin Rd
Evan Hewes Hwy
Ross Rd
Dunaway Rd
Jeffrey Rd
Westside Rd
Derrick Rd
Silbee Rd
Graham Rd
Schaniel Rd
Lyon Rd
Fisher Rd
Kubler Rd
Brockman Rd
Pulliam Rd
Anza Rd
Ferrell Rd
Clark Rd
Wahl Rd
Kloke Rd
Chick Rd
McCabe Rd
Heber Rd
Willoughby Rd
Jasper Rd
Dogwood Rd
IMPERIAL COUNTY - USA
ESTADOS UNIDOS MEXICANOS / BAJA CALIFORNIA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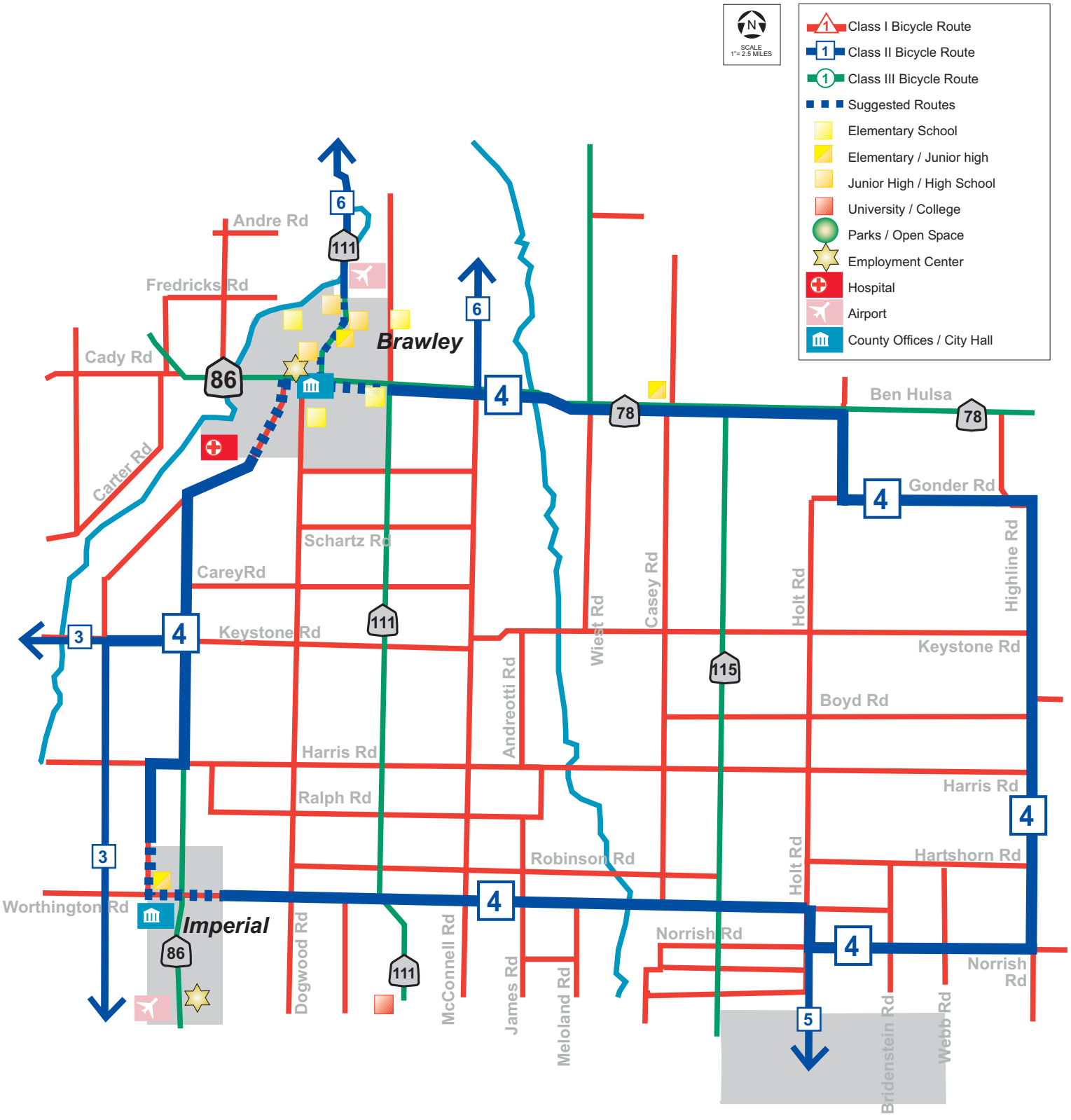
SCALE
1"= 2.5 MILES
Class I Bicycle Route
Class II Bicycle Route
Class III Bicycle Route
Suggested Routes
Elementary School
Elementary / Junior High
Junior High / High School
University / College
Parks / Open Space
Major Employment Center
Hospital
Airport
County Offices / City Hall
State Prison
CLOSED TO PUBLIC
U.S. NAVAL RANGES
Cady Rd
Weilman Rd
Lack Rd
Forrester Rd
Imler Rd
Keystone Rd
Austin Rd
Dogwood Rd
Edgar Rd
Wheeler Rd
Wienert Rd
Harris Rd
Ralph Rd
Payne Rd
Boley Rd
Worthington Rd
La Brucherie Rd
Imperial
Gullett Rd
Aten Rd
Hetzel Rd
Huff Rd
Silsbee Rd
El Centro
Haskell Rd
Bennet Rd
Seeley
Evan Hewes Hwy
Main St
Ross Rd
Dunaway Rd
Jeffrey Rd
Westside Rd
Derrick Rd
Krammer Rd
Drew Rd
McCabe Rd
Heber
Clark Rd
Dogwood Rd
3
4
8
1
2
5
9
86
111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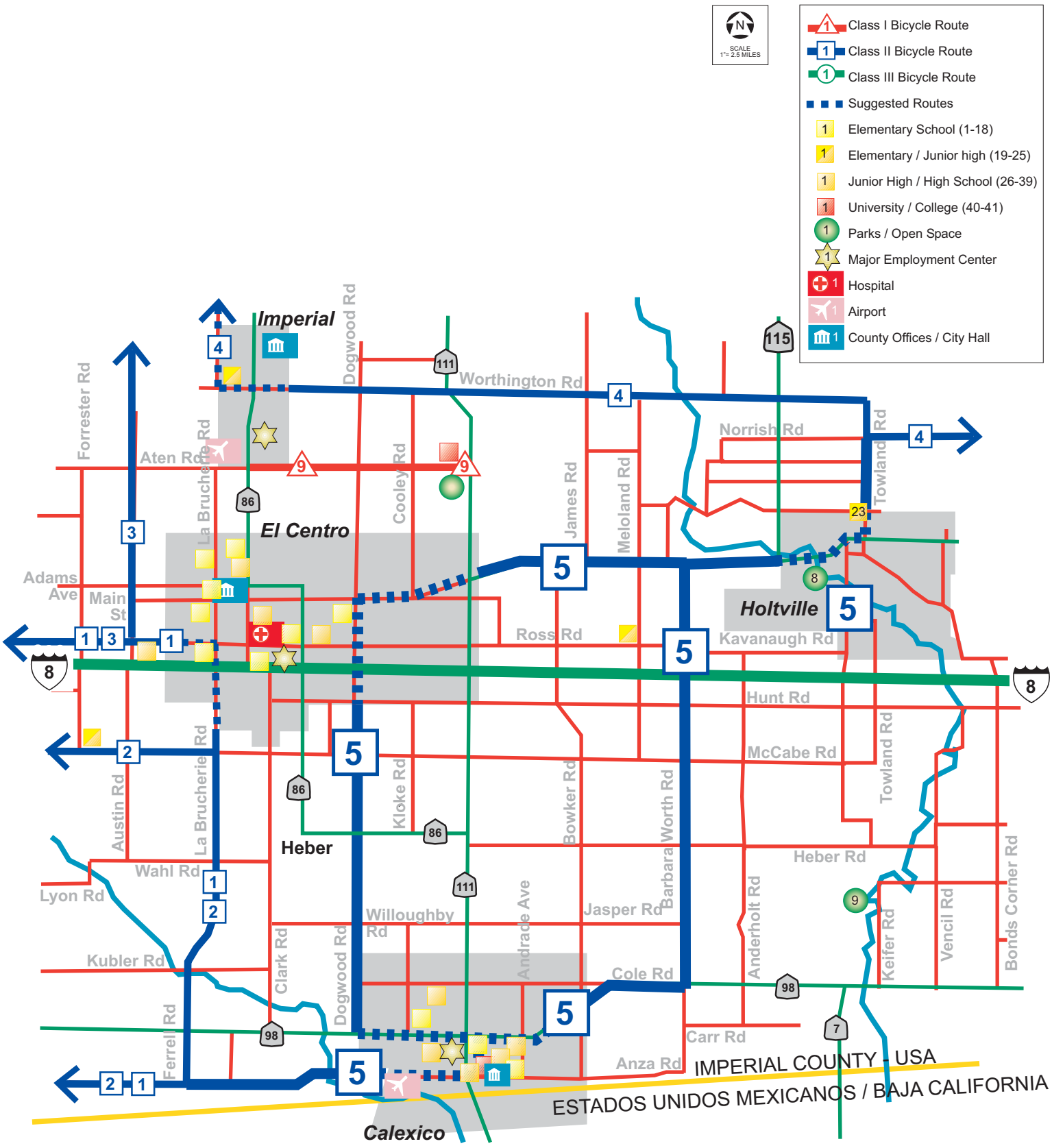
Class I Bicycle Route
Class II Bicycle Route
Class III Bicycle Route
Suggested Routes
Elementary School
Elementary / Junior high
Junior High / High School
University / College
Parks / Open Space
Employment Center
Hospital
Airport
County Offices / City Hall
Brawley
Imperial
Andre Rd
Fredricks Rd
Cady Rd
Carter Rd
Schartz Rd
CareyRd
Keystone Rd
Harris Rd
Ralph Rd
Worthington Rd
Dogwood Rd
McConnell Rd
James Rd
Meloland Rd
Andreotti Rd
Wiest Rd
Casey Rd
Holt Rd
Highline Rd
Ben Hulsa
Gonder Rd
Boyd Rd
Robinson Rd
Hartshorn Rd
Norrish Rd
Bridenstein Rd
Webb Rd
6
111
86
4
78
3
115
5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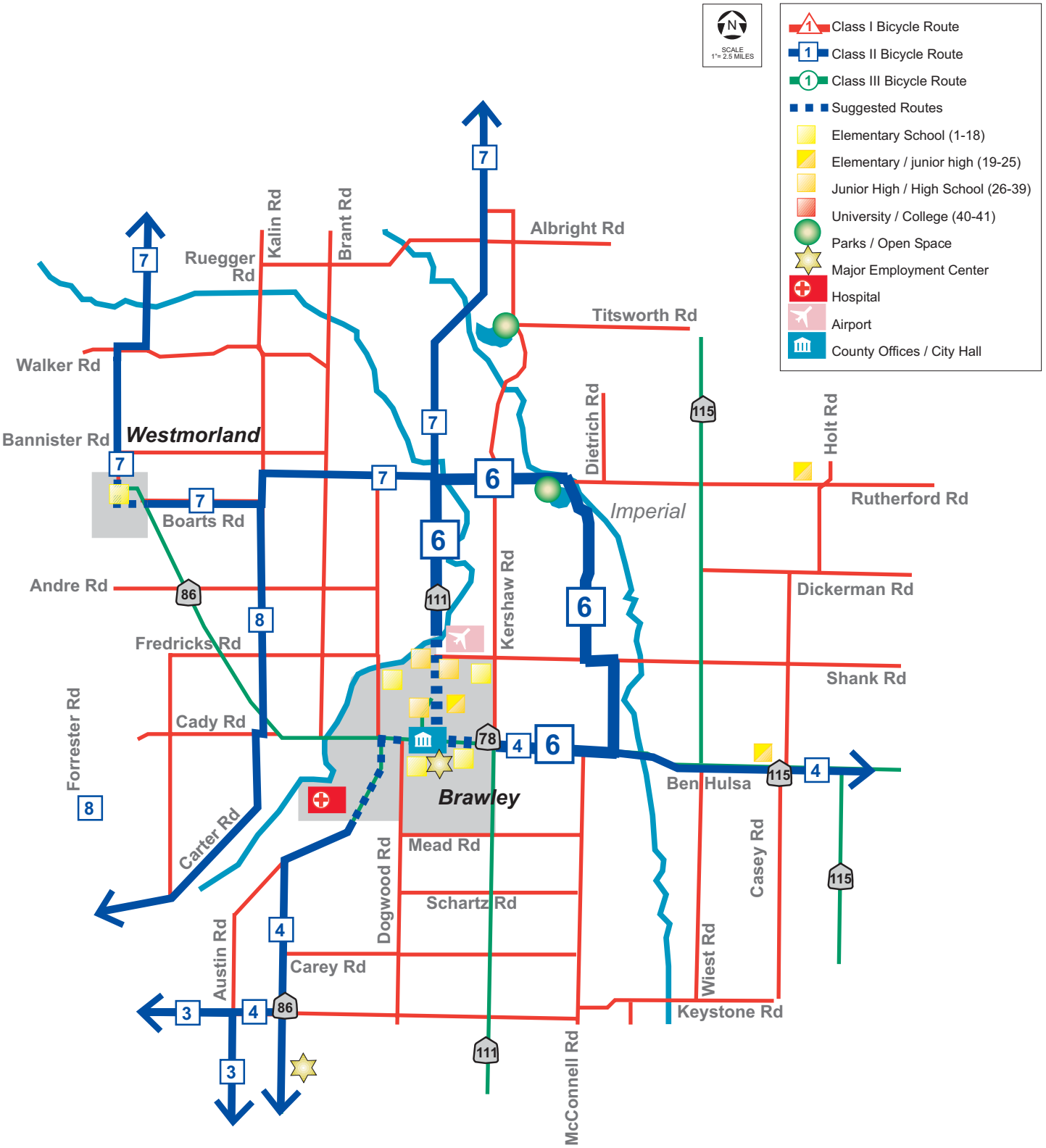
Class I Bicycle Route
Class II Bicycle Route
Class III Bicycle Route
Suggested Routes
Elementary School (1-18)
Elementary / Junior high (19-25)
Junior High / High School (26-39)
University / College (40-41)
Parks / Open Space
Major Employment Center
Hospital
Airport
County Offices / City Hall
Imperial
El Centro
Heber
Holtville
Calexico
Worthington Rd
Aten Rd
Ross Rd
Kavanaugh Rd
Hunt Rd
McCabe Rd
Heber Rd
Willoughby Rd
Jasper Rd
Cole Rd
Carr Rd
Anza Rd
Norrish Rd
Wahl Rd
Lyon Rd
Kubler Rd
Adams Ave
Main St
Forrester Rd
Austin Rd
La Brucherie Rd
Dogwood Rd
Cooley Rd
James Rd
Meloland Rd
Towland Rd
Bowker Rd
Barbara Worth Rd
Anderholt Rd
Keifer Rd
Vencil Rd
Bonds Corner Rd
Clark Rd
Ferrell Rd
Andrade Ave
Kloke Rd
IMPERIAL COUNTY - USA
ESTADOS UNIDOS MEXICANOS / BAJA CALIFORNIA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Class I Bicycle Route
Class II Bicycle Route
Class III Bicycle Route
Suggested Routes
Elementary School (1-18)
Elementary / junior high (19-25)
Junior High / High School (26-39)
University / College (40-41)
Parks / Open Space
Major Employment Center
Hospital
Airport
County Offices / City Hall
Albright Rd
Titsworth Rd
Ruegger Rd
Kalin Rd
Brant Rd
Walker Rd
Bannister Rd
Westmorland
Boarts Rd
Andre Rd
Fredricks Rd
Cady Rd
Forrester Rd
Carter Rd
Austin Rd
Carey Rd
Dogwood Rd
Mead Rd
Schartz Rd
McConnell Rd
Kershaw Rd
Dietrich Rd
Holt Rd
Rutherford Rd
Imperial
Dickerman Rd
Shank Rd
Brawley
Ben Hulsa
Casey Rd
Wiest Rd
Keystone Rd


SALTON SEA
N
SCALE 1"= 2.5 MILES
Class I Bicycle Route
Class II Bicycle Route
Class III Bicycle Route
Suggested Routes
Elementary School
Elementary / Junior High
Junior High / High School
University / College
Parks / Open Space
Major Employment Center
Hospital
Airport
County Offices / City Hall
Niland
Calipatria
Imperial
Brawley
Westmorland
Davis Rd
English Rd
Pound Rd
McDonald Rd
Sinclair Rd
Gentry Rd
Kalin Rd
Brandt Rd
Blair Rd
Lindsey Plant Rd
Eddins Rd
Main St
Wiest Rd
Wirt St
Bowles Rd
Albright Rd
Foulds Rd
Ruegger Rd
Quay Rd
Walker Rd
Titsworth Rd
Pellett Rd
Lack Rd
Dietrich Rd
Holt Rd
Bannister Rd
Boarts Rd
Rutherford Rd
Best Rd
Dickerman Rd
Andre Rd
Hoskins Rd
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Forrester Rd
Fredricks Rd
Shank Rd
Cady Rd
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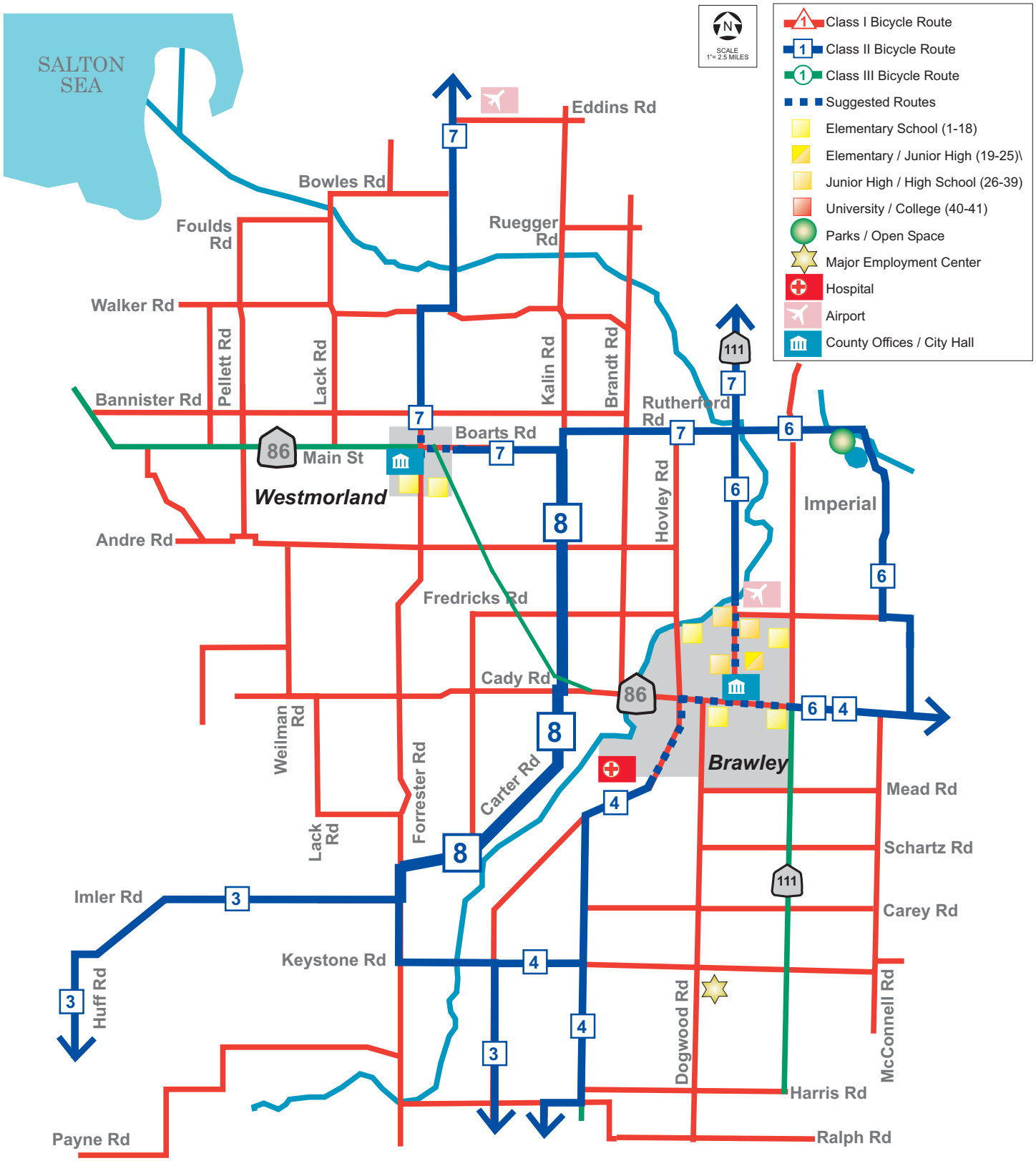
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N
SCALE 1"= 2.5 MILES
Class I Bicycle Route
Class II Bicycle Route
Class III Bicycle Route
Suggested Routes
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Elementary / Junior High (19-25)\
Junior High / High School (26-39)
University / College (40-41)
Parks / Open Space
Major Employment Center
Hospital
Airport
County Offices / City Hall
Eddins Rd
Bowles Rd
Foulds Rd
Ruegger Rd
Walker Rd
Pellett Rd
Lack Rd
Kalin Rd
Brandt Rd
Bannister Rd
Rutherford Rd
Boarts Rd
Main St
Westmorland
Hovley Rd
Imperial
Andre Rd
Fredricks Rd
Cady Rd
Weilman Rd
Forrester Rd
Carter Rd
Brawley
Mead Rd
Schartz Rd
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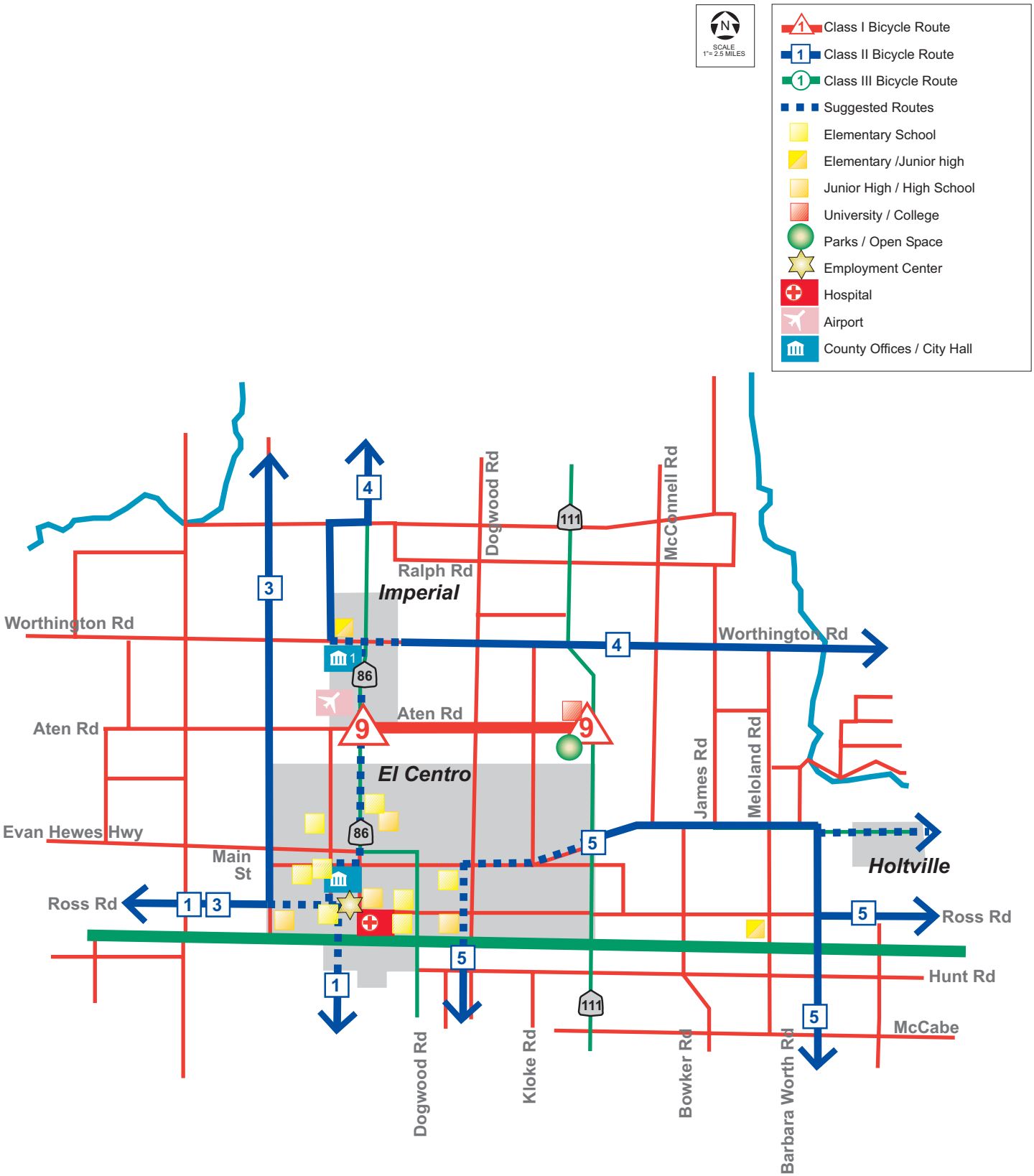
Keystone Rd
Huff Rd
Dogwood Rd
McConnell Rd
Harris Rd
Payne Rd
Ralph Rd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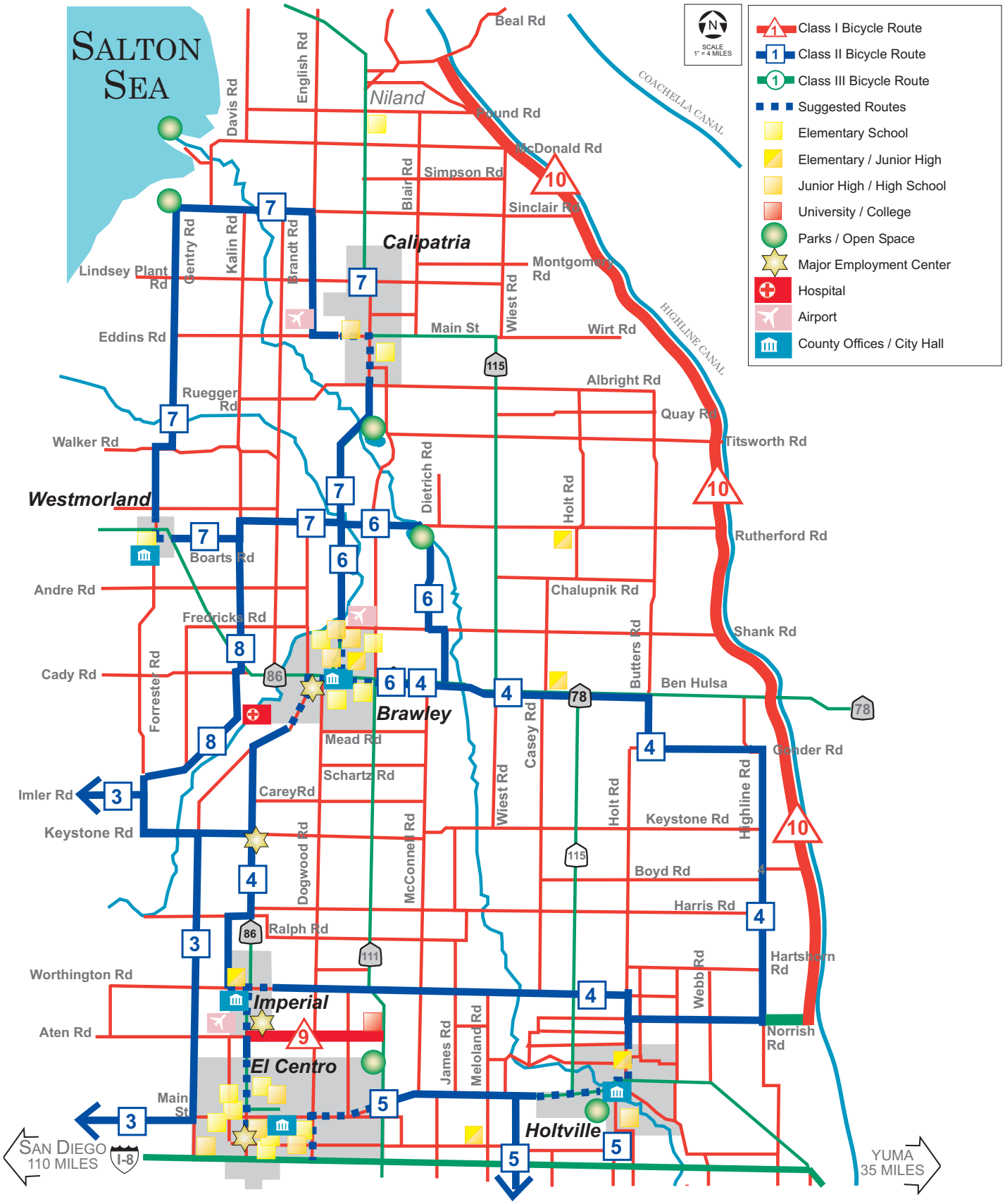
Class I Bicycle Route
Class II Bicycle Route
Class III Bicycle Route
Suggested Routes
Elementary School
Elementary /Junior high
Junior High / High School
University / College
Parks / Open Space
Employment Center
Hospital
Airport
County Offices / City Hall
Imperial
El Centro
Holtville
Worthington Rd
Aten Rd
Evan Hewes Hwy
Ross Rd
Main St
Ralph Rd
Dogwood Rd
McConnell Rd
James Rd
Meloland Rd
Hunt Rd
McCabe
Kloke Rd
Bowker Rd
Barbara Worth Rd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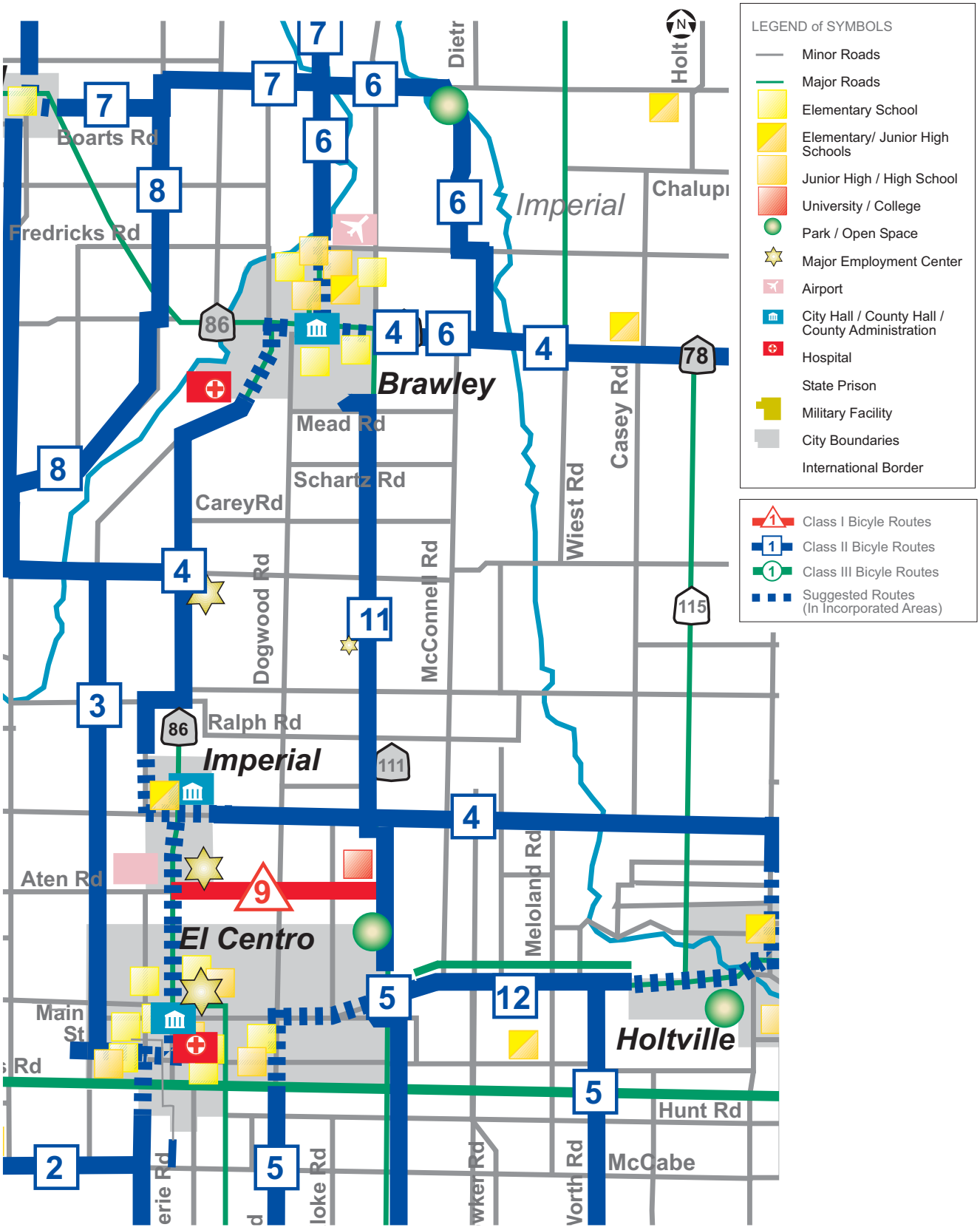
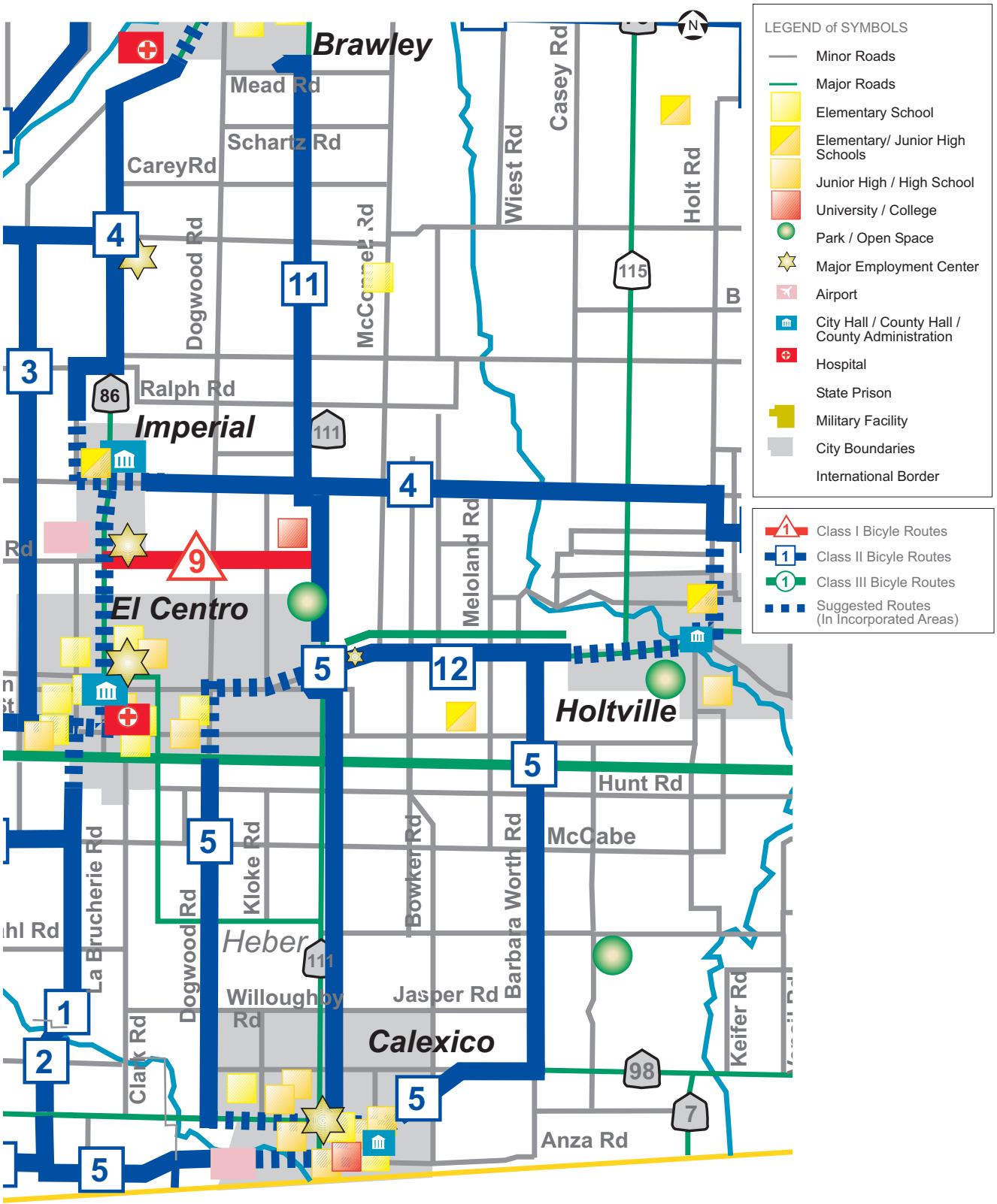
Calipatria
Westmorland
Brawley
Imperial
El Centro
Holtville
Beal Rd
Round Rd
McDonald Rd
Simpson Rd
Sinclair Rd
Montgomery Rd
Wirt Rd
Albright Rd
Quay Rd
Titsworth Rd
Rutherford Rd
Chalupnik Rd
Shank Rd
Ben Hulsa
Conder Rd
Keystone Rd
Boyd Rd
Harris Rd
Hartshorn Rd
Norrish Rd
Webb Rd
Highline Rd
Butters Rd
Holt Rd
Casey Rd
Wiest Rd
Dietrich Rd
Mead Rd
Schartz Rd
CareyRd
Dogwood Rd
McConnell Rd
James Rd
Meloland Rd
Ralph Rd
Worthington Rd
Aten Rd
Main St
Imler Rd
Forrester Rd
Cady Rd
Andre Rd
Fredricks Rd
Boarts Rd
Walker Rd
Ruegger Rd
Eddins Rd
Lindsey Plant Rd
Gentry Rd
Kalin Rd
Brandt Rd
Blair Rd
English Rd
Davis Rd
COACHELLA CANAL
HIGHLINE CANAL
SCALE 1" = 4 MILES
Class I Bicycle Route
Class II Bicycle Route
Class III Bicycle Route
Suggested Routes
Elementary School
Elementary / Junior High
Junior High / High School
University / College
Parks / Open Space
Major Employment Center
Hospital
Airport
County Offices / City Hall
SAN DIEGO 110 MILES
I-8
YUMA 35 MILES


LEGEND of SYMBOLS
Minor Roads
Major Roads
Elementary School
Elementary/ Junior High Schools
Junior High / High School
University / College
Park / Open Space
Major Employment Center
Airport
City Hall / County Hall / County Administration
Hospital
State Prison
Military Facility
City Boundaries
International Border
Class I Bicyle Routes
Class II Bicyle Routes
Class III Bicyle Routes
Suggested Routes (In Incorporated Areas)
Boarts Rd
Fredricks Rd
Imperial
Chalupi
Brawley
Mead Rd
Schartz Rd
CareyRd
Casey Rd
Wiest Rd
Dogwood Rd
McConnell Rd
Ralph Rd
Imperial
Aten Rd
El Centro
Meloland Rd
Main St
Holtville
Hunt Rd
McCabe
Holt
Dietr
Vorth Rd


Brawley
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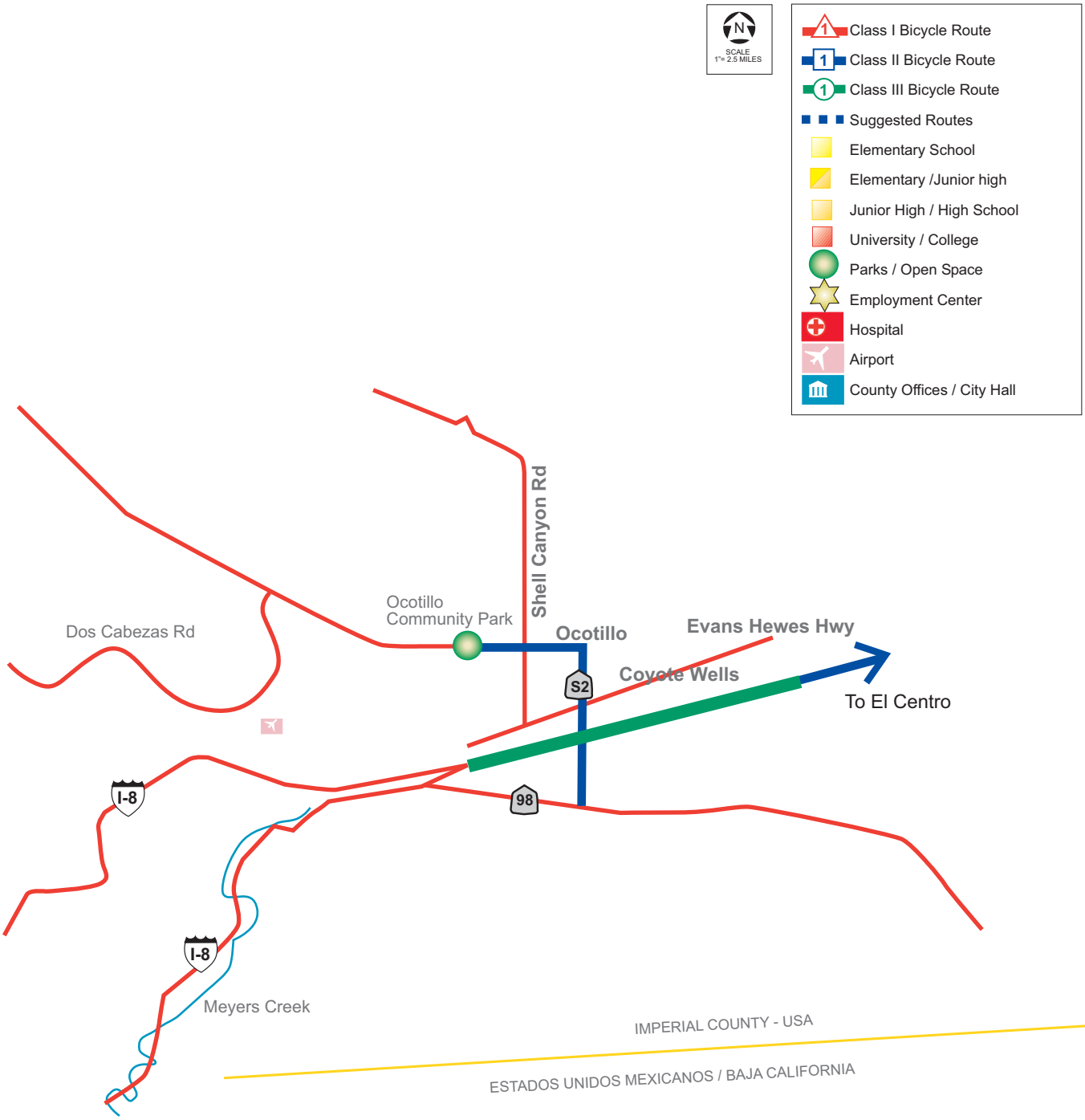
Schartz Rd
CareyRd
Dogwood Rd
McConnel Rd
Wiest Rd
Casey Rd
Holt Rd
115
11
4
3
86
Ralph Rd
Imperial
111
9
El Centro
Meloland Rd
5
12
Holtville
Hunt Rd
McCabe
Barbara Worth Rd
Bowker Rd
Kloke Rd
La Brucherie Rd
Heber
Willoughby Rd
Jasper Rd
Calexico
Keifer Rd
98
7
Anza Rd
1
2
LEGEND of SYMBOLS
Minor Roads
Major Roads
Elementary School
Elementary/ Junior High Schools
Junior High / High School
University / College
Park / Open Space
Major Employment Center
Airport
City Hall / County Hall / County Administration
Hospital
State Prison
Military Facility
City Boundaries
International Border
Class I Bicyle Routes
Class II Bicyle Routes
Class III Bicyle Routes
Suggested Routes (In Incorporated Areas)


N
SCALE
1"= 2.5 MILES
Class I Bicycle Route
Class II Bicycle Route
Class III Bicycle Route
Suggested Routes
Elementary School
Elementary /Junior high
Junior High / High School
University / College
Parks / Open Space
Employment Center
Hospital
Airport
County Offices / City Hall
Shell Canyon Rd
Ocotillo
Community Park
Dos Cabezas Rd
Ocotillo
Evans Hewes Hwy
Coyote Wells
To El Centro
S2
98
I-8
I-8
Meyers Creek
IMPERIAL COUNTY - USA
ESTADOS UNIDOS MEXICANOS / BAJA CALIFORNIA

C. Project Costs

The following is a list of typical costs for implementation based on the type of bicycle facility. The cost estimates include design and construction costs. All costs are based on 2002 dollars and should be adjusted based on more current rates. These costs are used to determine approximate cost to implement the proposed bikeway routes by miles. These costs may be used to determine the approximate costs to construct a route or segment. Preliminary engineering will provide a more definitive cost estimate.

TABLE 2
UNIT COST ESTIMATES

Bikeway Facility	Cost
Class III - Bike Route	
▪ Signing, minor surface repair	$1,000/mile
▪ Rural road widening (32" shoulder)	20% of total roadway improvement costs
Class II - Bike Lane	
▪ Signing and Striping only	$ 5,000/mile
▪ Signing, striping, minor surface repair	$20,000/mile
▪ Signing, striping, road widening	$65,000/mile
Class I Bike Path	
▪ Rehabilitate or upgrade existing path	$50,000/mile
▪ Construct Road Oyl Path on base. Includes signing.	$52,000/mile
▪ Construct Road Oyl Path on base. Includes signing with removal of existing railroad tracks.	$96,000/mile
▪ Construct asphalt path on existing level embankment, or right of way, includes signing, striping for two-way path.	$150,000/mile
▪ Construct asphalt path on existing level embankment, or right of way, includes signing, striping with removal of existing railroad tracks.	$194,000/mile
Support Facilities:	
▪ Bicycle Racks	$420 ea. (parks 12 bikes)
▪ Bicycle Lockers	$1,000 ea. (parks 2 bikes)
▪ Paved Parking Space	$2,200 (parks 10-12 bikes)
▪ Signal Loop Detectors	$2,500/intersection
▪ Undercrossing	$150,000 - 350,000/ea.
▪ Signing, striping	$5,000/mile
▪ Signing, striping, signals	$65,000/mile
▪ Irrigated Landscaping	$350,000 - 600,000/mile
▪ Non-irrigated Landscaping	$150,000 - 300,000/mile
▪ Bridge (8' wide)	$60 – 100/square foot
▪ Fencing	$20/linear foot
▪ Railroad Crossing	$125,000/ea.
▪ Emergency Cellular Phone (installed)	$3,500/ea.
▪ Benches (concrete 8’ long)	$1,000/ea.
▪ Trash Receptacle (concrete)	$500/ea.
▪ Rural pathway (native soil - 5’ wide)	$40,000/mile

The above are estimates only, more detailed estimates should be developed after preliminary engineering.

Implementation costs for each route are based on typical construction costs. Table 4 lists each segment, length of the segment, and estimated cost for implementation. From a bikeway perspective, bike lanes may be installed along the roadway providing adequate width is available. The County's roadways are generally wide enough to accommodate bicycle lanes provided there is also adequate width for vehicle parking. The exceptions to this occur when drainage ditches, curb cuts, utility poles or lack of right-of-way make widening cost prohibitive.

Relocation of utilities or the removal of drainage ditches would be estimated on a case by case basis. The County should install loop detectors at an estimated cost of $2,500 per intersection when repairing the streets, replacing utilities that require cutting into the asphalt, or when installing new traffic lights. Loop detectors designed to detect bicyclists at stop lights will encourage bicyclists to cycle more often and deter cyclists from darting across streets when the lights turn red.

"Why cyclists Run Red Lights" by Tom Revay wrote that cyclists would not run red lights as often if they were in the lane of traffic rather than to the right of traffic, as they would wait in line with vehicles. However, the average cyclists doesn't want to wait in the main stream of traffic as they are concerned with getting up to speed with cars and hindering the flow of traffic. Additionally, if the cyclist is in the front of the line, a traffic signal set to change when a vehicle arrives will not change unless the detection system can recognize a bicycle in the lane of traffic. It might be better suited for the traffic light to recognize a cyclist in the bicycle lane and change accordingly.

TABLE 3
COST ASSUMPTIONS FOR CLASS I BIKEWAY

Multi Use Trail/Bike Path (8')	**Cost Per LF**
Adjacent to roadway, level terrain, minimal grading	$50 - 65
Adjacent to roadway, moderate slope, some cut and fill	$60 - 75
Adjacent to roadway, steep slope, retaining wall	$90 - 110
Level terrain, minimal grading	$20 - 25
Moderate slope, some cut and fill	$25 - 35
Roadway Improvements	**Cost per LF**
2 - 4 feet asphalt/base, some fill, debris removal, relocate some fencing and utilities, restripe	$25 - 35
2 - 4 feet asphalt/base, some fill, debris removal, relocate some fencing and utilities, restripe, and new guardrail	$60 - 70

TABLE 4
WORKSHEET FOR BIKEWAY COSTS

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Total Cost
1	Clearing & Grubbing		L.F.	$10-40	
2	Earth/Excavation		C.Y.	$30-40	
3	Asphalt Concrete Pavement		S.F.	$1.20 - 1.50	
4	Traffic Bike Lane Stripe		L.F.	$.60 - .80	
5	Pavement Markings		EA.	$40 - 50	
6	Fencing (chain link)		L.F.	$16 - 20	
7	Guardrail		L.F.	$20 - 25	
8	8' Steel or Concrete Bridge		L.F.	$1,200 - 1,500	
9	3' Retaining Walls (Concrete)		S.F.	$32 - 40	
10	Relocate Signs/Fencing		L.F.	$1.00 - 2.00	
11	Drainage		L.F.	$1.00 - 5.00	
12	Environmental Mitigation		L.F.	$.50 - 2.50	
13	Traffic/Bike Path Signing		L.F.	$2.40 - 3.00	
14	Lighting		EA.	$500.00	
15	Traffic Control		L.F.	$.20 - .40	
16	Clean-up		L.F.	$.10 - .20	
Subtotal 15% Design Cost 20% Contingency					
Total Cost					

B. Phasing Plan

The proposed 253.5-mile bikeway system, consisting of 13 different bicycle routes was based on existing bikeway routes and specific selection criteria. The total estimate to complete the Bicycle Master Plan is $6,408,000. Phasing is ultimately based upon the availability of funding. Route 1 was determined by the staff as high priority based on prior safety concerns identified in Chapter 4, Accident/Safety Analysis, high demand by children, is part of a regular group ride and links to major employment in both El Centro and Calexico. The cost to construct Phase 1 is $570,000 assuming moderate improvements are needed to construct bicycle lanes.

Factors which determine which route may be constructed is based on a) availability of funding for specific types of bikeways, b) capital improvement projects such as road widening, or c) immediate safety concerns about a specific area.

TABLE 6
BIKEWAY RANKING: PHASE I (HIGH PRIORITY)
COUNTY OF IMPERIAL BICYCLE MASTER PLAN

Segment	Class	A	B	C	D	Total	Length (Miles)	Cost
1. Ross/La Brucherie/ Drew	II	3	3	3	3	12	28.5	$570,000
2. McCabe/ La Brucherie	II	2	2	1	1	6	17.7	354,000
3. Austin Road / Ross Rd.	II	3	3	1	0	7	30.0	660,000
4. Worthington Rd/ Highline	II	2	2	4	3	11	48.8	352,000
5. Barbara Worth/Evan Hewes	II	3	2	12	2	19	[1]27.9	352,000
6. Weist Park Loop	II	2	2	8	2	14	[2]15.0	220,000
7. Sinclair/Rutherford/ SR 111	II	2	2	3	2	9	[3]29.7	454,000
8. Austin Road Connection	II	2	2	1	1	6	8.0	230,000
9. Imperial Valley College	I	3	2	1	1	7	3.8	190,000
10. Highline Canal	I	3	1	0	0	4	31.2	[4]1,879,000
11. SR - 111	II	3	3	1	2	9	6.0	390,000
12. Southern Pacific Railroad	I	2	2	1	3	8	6.0	900,000
13. Ocotillo Community Park	II	1	2	1	0	4	1.5	97,500
Subtotal							240.6	6,648,500
Reduction due to shared Class II routes between Routes 1, 3, 4								240,000
Total								$6,408,000

Legend:
A. Estimated Usage (1 = low, 3 = high)
B. Safety Concern (1 = low, 3 = high)
C. Schools/Parks (actual number of schools)
D. Employment Centers (actual number of centers)
[1] 17.6 within the County, 10.3 within El Centro.
[2] 4 miles located within the City of Brawley.
[3] 7 miles located within the Cities of Westmorland and Calipatria.
[4] Cost for the Class 1 bicycle path is based on a Road Oyl surface.

Roadway conditions in the unincorporated areas of Imperial Valley consist of primarily two-way traffic constructed to approximately 22' - 30'. From a bikeway perspective bike lanes may be installed on a widened asphalt shoulder with modest costs. The exceptions to this exist when drainage ditches, curb cuts, utility poles of lack of right-of-way make widening expensive. The roadways surveyed and proposed to accommodate bikeways generally may accommodate road widening with minimal additional costs or improvements.

Bicycles interface with traffic on a regular basis throughout the bikeway system. Generally, the low traffic volumes and limited roadway crossings reduce the potential for conflicts. The Class I bikeway path proposed along Highline Canal would not cross any major roadways and can be accommodated within the existing right-of-way. Along the Class I bikeway path, it is recommended that barriers or other devices be installed at the end of each segment where the canal crosses a roadway or where there are mechanisms which control the flow of water into adjacent canals.

Bicycle facilities must be maintained in an appropriate manner and an ongoing maintenance program should be established. Well-maintained bicycle facilities increase safety, encourage use of the facilities, and increase longevity of the facility. The maintenance program should include a periodic review of the condition of signs, pavement markings, barriers, and surface condition. Roadway dirt, debris, and potholes affect cyclists to a greater extent than cars. It is

recommended that routine surveys of the bicycle facilities are conducted to remove glass and other debris, especially on Class I bicycle paths, and to conduct routine restriping and sign replacement. Negotiation of maintenance responsibility for the proposed Class I bicycle paths located along the All American Canal or the Southern Pacific Railway will need to be closely coordinated, with the property owner, prior to developing detailed construction documents.

It is recommended that the City designate a staff person or appoint a local organization to serve as the bicycle coordinator. Then, local residents know whom to contact when there are maintenance, connectivity, and general concerns for cyclists. This person would have the primary responsibility to implement the Master Plan by pursuing grant funds, coordinating with the Public Works or Engineering Department to incorporate bikeways into the Capital Improvement Program (CIP), and updating the Master Plan as appropriate. Tasks for the bicycle coordinator may include:

- Pursuing grants for bikeway projects and bicycle programs.
- Participating in Imperial Valley Association of Governments (IVAG) bicycle committees and other regional transportation groups involved in funding programs and transportation planning.
- Coordinating and promoting bikeway education, incentives, and awareness programs and events.
- Serving as the contact person for bikeway questions and concerns.
- Reviewing the Regional Transportation Improvement Plan (RTIP) to ensure consistency with local and regional bikeways.
- Participating with IVAG in the developing the RTIP as it relates to bicycle facilities.
- Assembling and storing bicycle accident data, usage data, and other statistical bikeway data that may be used for grant funding applications.
- Maintaining a log of maintenance tasks, costs, and scheduled bikeway improvements.
- Serve as a clearinghouse for filtering community concerns, education materials and for coordinating volunteer groups.
- Review and provide an update of the Master Plan to the City Council at a minimum of every four years and forward to Caltrans for review and approval.

E. Bikeway Funding

Planning efforts are constrained by concern about limited implementation resources. Why prepare a grand plan when there is no money to turn it into a reality? However, projects that are part of comprehensive plans often have a competitive edge over stand-alone projects. Also, there are many different ways to combine funding and other resources. Federal, state and local government agencies invest billions of dollars every year in the nation's transportation systems. Only a fraction of that funding is in planning, designing and/or constructing bicycle facilities. In California, a percentage of the gas tax is allocated for bicycle facilities. Effective January 1, 1998, the State of California's Bicycle Transportation Account was increased from $360,000 a year to $5 million a year. A good resource for bicycle funding programs is “The 2nd Guide of the Guide to Bicycle Project and Program Funding in California” available through the California Bicycle Coalition at www.calbike.org.

Whether the City is trying to implement a comprehensive multi-year bicycle plan or complete a specific project, the following strategies and programs can help secure the resources needed, such as:

- Federal Funds and Programs
- State Funds
- Piggybacking
- New Development
- Partnerships

Federal Funds and Programs

In 1998, ISTEA funds were reauthorized by TEA-21 (Transportation Equity Act for the 21st Century). Funds for bicycle projects in Imperial County over the next six years should increase over the levels under ISTEA since 1992. Changes in TEA-21 include:

- The **Surface Transportation Program** (STP) will allocate funds of $320 million statewide for bike and pedestrian projects. This program requires a 20% local match funds. Information available at www.dot.ca.gov/hq/transprog/cmaqstp.htm

- The **National Highway System** (NHS) program provides funding for bicycle programs within Interstate corridors. Eligible projects include pedestrian and bicycle safety programs, program implementation, and identification of highway hazards. This program requires a 20% local match. Further information contact www.fhw.dot.gov/tea21/factsheets

- The **Congestion Mitigation and Air Quality Improvements** (CMAQ) information is available at www.dot.ca.gov/hq/transprog/reports/Official_CMAQ_Web_Page.htm

- **National Recreational Trails Program** provides $6 million statewide. Funds are available for recreational trails for use by bicyclists, pedestrians, and other non-motorized and motorized users. Projects must be consistent with a Statewide Comprehensive Outdoor Recreation Plan (SCORP). More information can be found at www.parks.ca.gov/grants/index.htm

- The **Hazard Elimination Program** (HEP) offered through Caltrans includes funding for bicycling and walking hazards. Definition of a 'public road' now expended to include bikeways, pathways, and traffic calming measures.

- A new category, ***Transit Enhancements Program***, was created that calls for transit agencies in urbanized areas over 200,000 population to use 1 percent of their Urban Formula Funds for Transit Enhancements Activities. Up to $50 million per year may be available for pedestrian access, walkways, bicycle access, bike storage facilities, and bike-on-bus racks. The program calls for 95% Federal/5% local match.

- ***Federal Lands Highway Program Fund -*** This Discretionary Program provides funding for any kind of transportation project (including pedestrian and bicycle facilities) that are within, provide access to or are adjacent to public lands. Facilities must be incorporated into the RTIP. Approximately $150 million per annum rising to $165 million in FY 2003. No match is required.

- ***Scenic Byways Program Fund*** - This program provides funding for the planning, design, and development of a State Scenic Byways Program. Funds may be used for the construction of facilities along the highway for the use of pedestrians and bicyclist, including pedestrian/bicycle access, safety improvements, and rest areas. Approximately $10 million annually statewide. A 20% local match is required.

State Funds and Programs

Planning provisions for states and MPOs have been streamlined, with bicycle and pedestrian needs to be given consideration in the development of regional transportation plans. Specific policies include directives to not approve any project or regulatory action that will have an adverse impact on non-motorized safety, unless a reasonable alternative route is provided or already exists.

The ones most relevant for bicycle and pedestrian planning include:

- ***Bicycle Transportation Account (BTA)*** – Available for jurisdictions with approved bicycle transportation plans and consistent with the local Regional Transportation Plans (RTP), this program funds projects, which demonstrate to improve the safety and convenience of commuter bicycling. No agency may receive more than 25% of the total funds appropriated. A local match of 10% is required. Additional information is available at www.dot.ca.gov/hq/LocalPrograms/

- ***Transportation Development Act (TDA)*** - One quarter cent of retail sales tax is returned to the county of origin. Up to two percent of funds can be set aside for pedestrian and bicycle facilities, and five percent can be spent for supplementing other funds to implement bicycle safety education programs. The local MPO distributes funds.

- ***Safe Routes to School*** - Funds programs for sidewalks and bicycle facilities, which directly benefit access to schools. A 10% match is required. Deadlines for applications is May 31 and December 1 of each year. Individual applications cannot exceed 450,000. Contact www.dot.ca.gov/hq/LocalPrograms/

- ***Environmental Enhancement and Mitigation Program (EEM)*** - Funds are allocated to projects that offset environmental impacts of modified or new public transportation facilities and the acquisition or development of roadside recreational facilities, such as trails. A 20% match is required with the $250,000 maximum application requests. Grant applications are due in November of each year. Contact www.dot.ca.gov/hq/LandArch/eem/eemfram.htm

- ***Recreational Trails Program*** --This program provides up to 80% funding for assistance for acquisition, development, rehabilitation and maintenance of motorized and non-motorized recreation trails.

- ***Habitat Conservation Fund Grant Program*** - This program originates from the California Wildlife Protection Act of 1990 (Prop 117). Eligible projects include the acquisition of various types of wildlife habitats; enhancement and restoration of various Projects must be incorporated into the RTIP if they are regionally significant. The local

match can not be a state source. Provides a maximum of $500,000 with 50% local match for construction of projects. Contact www.parks.ca.gov/grants/hcf.htm

- ***Land and Water Conservation Fund*** - The program provides grants to eligible local governments to protect open space and provide enhanced outdoor recreational opportunities. Land acquired form the program must be maintained in perpetuity for public open space and natural resource recreational purposes. Funding requests cannot exceed $200,000. Applications are due May 1. Contact www.parks.ca.gov/grants/wcf/wcf.htm

- ***Office of Traffic** Safety (OTS)* – Grants are provided to agencies for educational programs. Grants are due in October of each year. Contact www.ots.ca.gov

- ***Air Pollution Control District (APCD)*** – Each local air district funds projects that can be determined to reduce air pollution through implementation. Grant applications and due dates vary by each individual air pollution control district.

- **TransNet Local Sales Tax Program (Proposition A)**
  Proposition A is a local sales tax to fund transportation improvements. The tax generates $1 million annually. The funds are used to augment the available TDA funds. Proposition A funds are lumped with 2% TDA funds. No matching funds are required.

Piggybacking

It is more cost effective to include bicycle and pedestrian accommodations into a larger scale transportation project than it is to retrofit – or piggybacking on another project. Refer to the policies and bikeway network in your bicycle plan to help justify the accommodation of cyclists in local road projects. If a road is being resurfaced, work with the implementation agency to restripe it to include bicycle lanes or wide curb lanes. If a bridge is being reconstructed, make sure cyclists and pedestrians will have a way to safely and comfortably get across it. If a train station is being built, make sure pedestrians and cyclists have a way to easily access it. Close coordination with planning, public works and engineering department staff as well as IVAG and Caltrans can result in cost-effective improvements that benefit the entire community.

New Development

Another no-cost implementation strategy is to pass ordinances that require new developments to be designed in accordance with your bicycle and pedestrian plans. For example, ordinances and zoning can mandate including sidewalks, providing bicycle parking, designing streets that discourage speeding and building car parking facilities that minimize pedestrian conflicts at entrance and exit points.

Partnerships

There are various private organizations that provide funding for bicycle facility implementation projects. “Bikes Belong Coalition” funds up to $10,000 for approved projects. Contact www.bikesbelong.org. Recreational Equipment, Inc. (REI) also offer funding programs that improve recreational opportunities. Each application cannot exceed $2,500. Contact www.rei.com.

APPENDIX

A. SOURCES CONSULTED

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B. FUNDING PROGRAM CONTACTS

Imperial Valley Association of Governments (IVAG)
940 West Main Street, Suite 208, El Centro, CA 92243
Contact: Rosa Lopez - (760) 482-4290

Caltrans, Office of Transportation Enhancement Activities
1120 N Street, Sacramento, CA 95814
Contact: Marsha Mason - (916) 654-5275

Caltrans, Division of State and Local Project Development
Office of Local Programs, P.O. Box 942874, Sacramento, CA 94274-0001
Contact: Mel Aros - (916) 653-8220

California Department of Transportation
Division of Planning, 1120 N Street, P.O. Box 942873, Sacramento, CA 95814
Contact: Donna Long - (916) 324-6514

Caltrans Division of Structures, Local Assistance and Programming Branch
1801 30th Street, Sacramento, CA 95816
Contact: Gene Cowley - (916) 227-8023

State Department of Parks and Recreation
P.O. Box 942896, Sacramento, CA 94296-0001
Contact: (916) 653-8803

Office of Traffic Safety
7000 Franklin Boulevard, Suite 440, Sacramento, CA 95823
Contact: Arthur L. Anderson - Director (916) 445-0527

Public Affairs Office, United States Forest Service Department
630 Sansome Street, San Francisco, CA 94111
Contact: Denise Mills-Ford - (415) 705-2703

Caltrans District Office, Caltrans Office of Bicycle Facilities
P.O. Box 942874, Sacramento, CA 94274-0001
Contact: Richard L. Blunden, Chief - (916) 653-0036

State Lands Commission
1807 13th Street, Sacramento, CA 95814
Contact: Mary Howe, (916) 322-5645

State of California Resources Agency
1416 Ninth Street, Suite 1311, Sacramento, CA 95814
Contact: Hal Waraas - (916) 653-9709

Imperial County Area Air Pollution Control District
150 South 9th Avenue, El Centro, CA 9243
Contact: Stephan Birdsall

Federal Highway Administration, Intermodal Division, Hep-50
400 Seventh Street, S.W., Room 3222, Washington, DC 20590
Contact: John C. Fegan - (202) 366-5007

PROPOSED BICYCLE NETWORK MAPS

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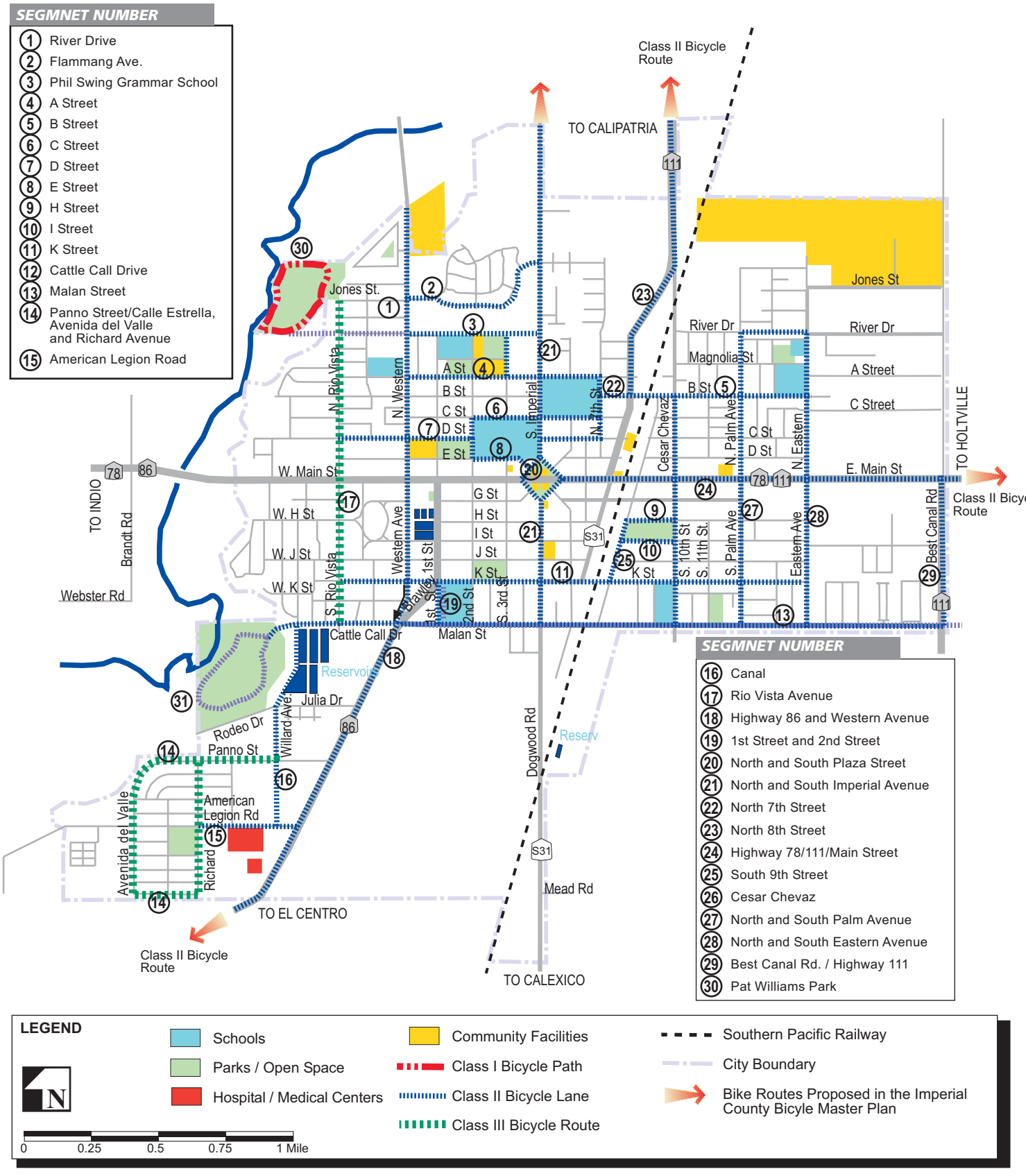
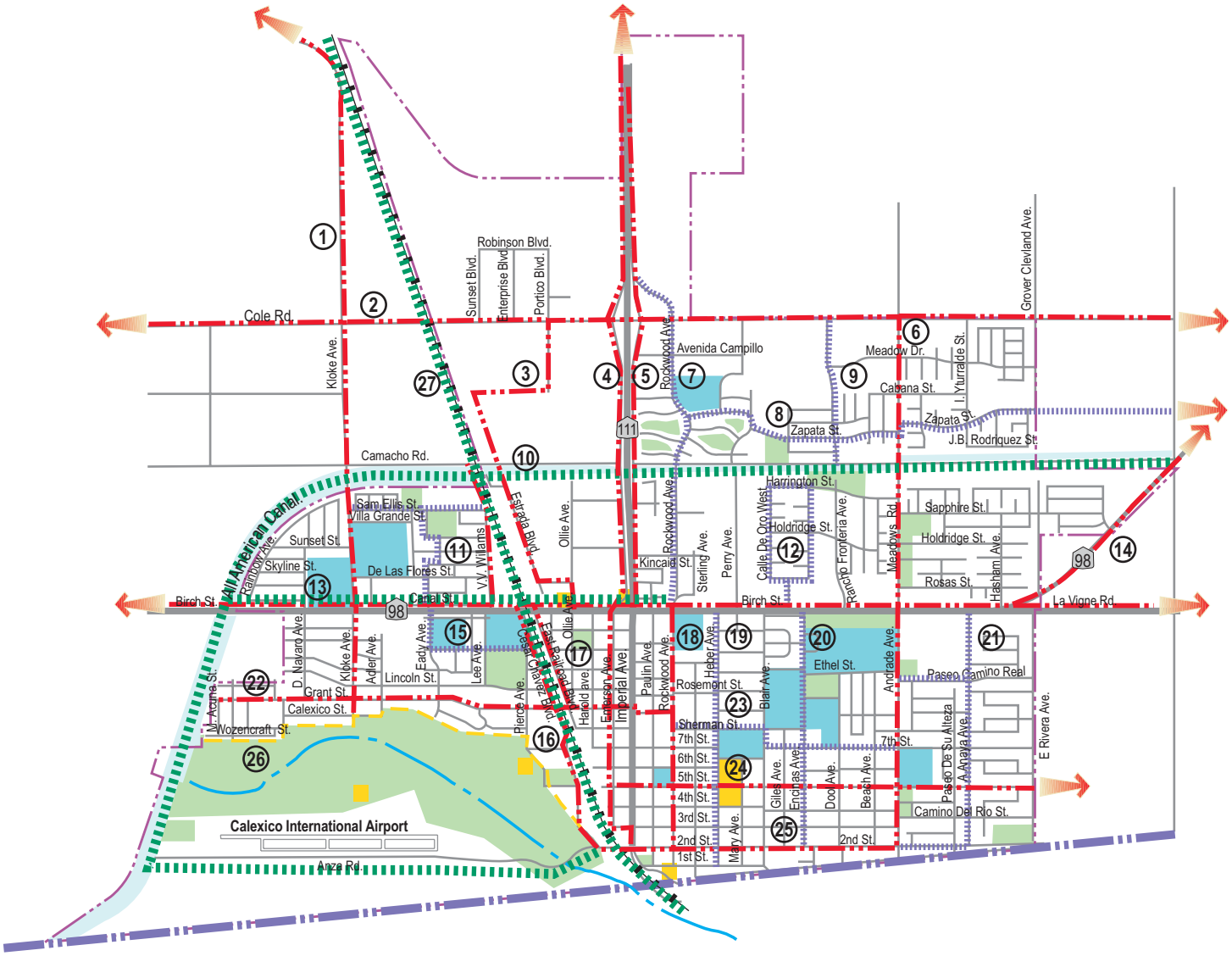

SEGMNET NUMBER
1 River Drive
2 Flammang Ave.
3 Phil Swing Grammar School
4 A Street
5 B Street
6 C Street
7 D Street
8 E Street
9 H Street
10 I Street
11 K Street
12 Cattle Call Drive
13 Malan Street
14 Panno Street/Calle Estrella, Avenida del Valle and Richard Avenue
15 American Legion Road
Class II Bicycle Route
TO CALIPATRIA
Jones St.
Jones St
River Dr
Magnolia St
A Street
C Street
TO HOLTVILLE
E. Main St
W. Main St
TO INDIO
Brandt Rd
Webster Rd
W. H St
W. J St
W. K St
N. Rio Vista
S. Rio Vista
N. Western
Western Ave
N. Imperial
S. Imperial
N. 7th St
Cesar Chevaz
N. Palm Ave
S. Palm Ave
N. Eastern
Eastern Ave
S. 10th St
S. 11th St.
Best Canal Rd
Class II Bicycle Route
A St
B St
C St
D St
E St
G St
H St
I St
J St
K St
1st St
2nd St
S. 3rd St
Brawley
Malan St
Cattle Call Dr
Reservoir
Julia Dr
Willard Ave
Rodeo Dr
Panno St
American Legion Rd
Avenida del Valle
Richard
TO EL CENTRO
Class II Bicycle Route
Dogwood Rd
Reserv
Mead Rd
TO CALEXICO
SEGMNET NUMBER
16 Canal
17 Rio Vista Avenue
18 Highway 86 and Western Avenue
19 1st Street and 2nd Street
20 North and South Plaza Street
21 North and South Imperial Avenue
22 North 7th Street
23 North 8th Street
24 Highway 78/111/Main Street
25 South 9th Street
26 Cesar Chevaz
27 North and South Palm Avenue
28 North and South Eastern Avenue
29 Best Canal Rd. / Highway 111
30 Pat Williams Park
LEGEND
Schools
Parks / Open Space
Hospital / Medical Centers
Community Facilities
Class I Bicycle Path
Class II Bicycle Lane
Class III Bicycle Route
Southern Pacific Railway
City Boundary
Bike Routes Proposed in the Imperial County Bicyle Master Plan
N
0 0.25 0.5 0.75 1 Mile



SEGMENT NUMBER

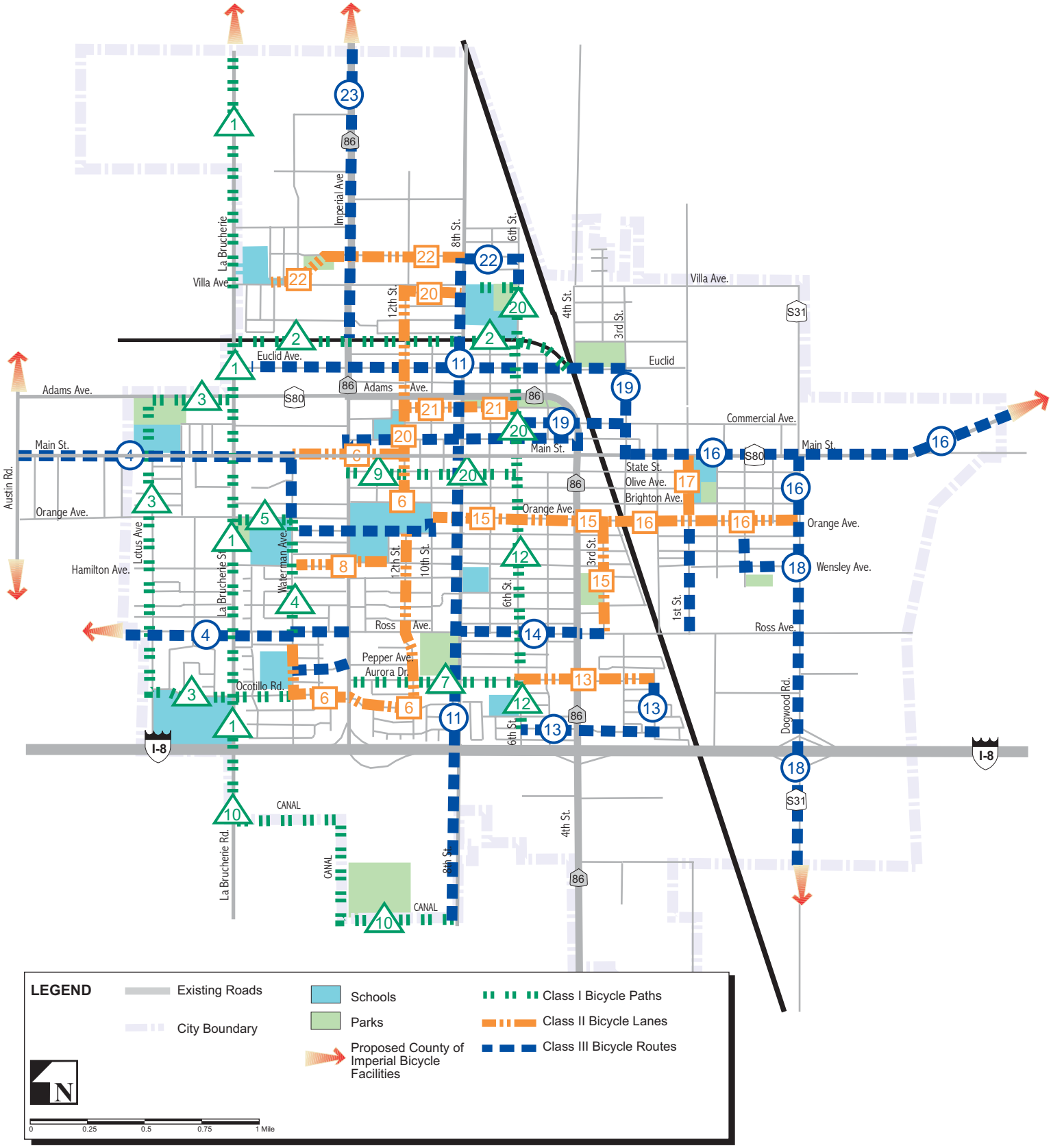
1. Kloke Ave.
2. Cole Rd.
3. Estrada Blvd.
4. Frontage Rd. West
5. Frontage Rd. East
6. Meadows Rd.
7. Rockwood Ave.
8. Zapata St.
9. Rancho Frontera Ave.
10. All American Canal
11. Sam Ellis Street
12. Calle De Oro West Loop
13. State Highway 98
14. State Highway 98 Northeast
15. Eady Ave.
16. Cesar Chavez Blvd.
17. East Railroad Blvd.
18. Rockwood Ave.
19. Heber Ave.
20. Encinas Ave.
21. A. Anaya Ave.
22. Grant St.
23. Sherman Ave.
24. 5th St.
25. 2nd St.
26. New River Greenway
27. Railroad Multi-use Path

LEGEND

N

0 0.25 0.5 0.75 1 Mile

- Schools
- Parks / Open Space
- Community Facility
- Southern Pacific Railway
- City Boundary
- International Boundary
- Proposed Imperial County Bicycle Master Plan
- Class I Bicycle Path
- Class II Bicycle Lane
- Class III Bicycle Route
- Mountain Bicycle/ Hiking Trail


Imperial Ave
La Brucherie
Villa Ave
8th St
6th St
12th St.
4th St.
3rd St.
Euclid
Euclid Ave.
Adams Ave.
Main St.
Commercial Ave.
State St.
Olive Ave.
Brighton Ave.
Orange Ave.
Austin Rd.
Lotus Ave
Waterman Ave.
Hamilton Ave.
12th St.
10th St.
6th St.
3rd St.
1st St.
Wensley Ave.
Ross Ave.
Pepper Ave.
Aurora Dr.
Ocotillo Rd.
Dogwood Rd.
I-8
CANAL
La Brucherie Rd.
8th St.
4th St.
S80
S31
86
LEGEND
Existing Roads
City Boundary
Schools
Parks
Proposed County of Imperial Bicycle Facilities
Class I Bicycle Paths
Class II Bicycle Lanes
Class III Bicycle Routes
N
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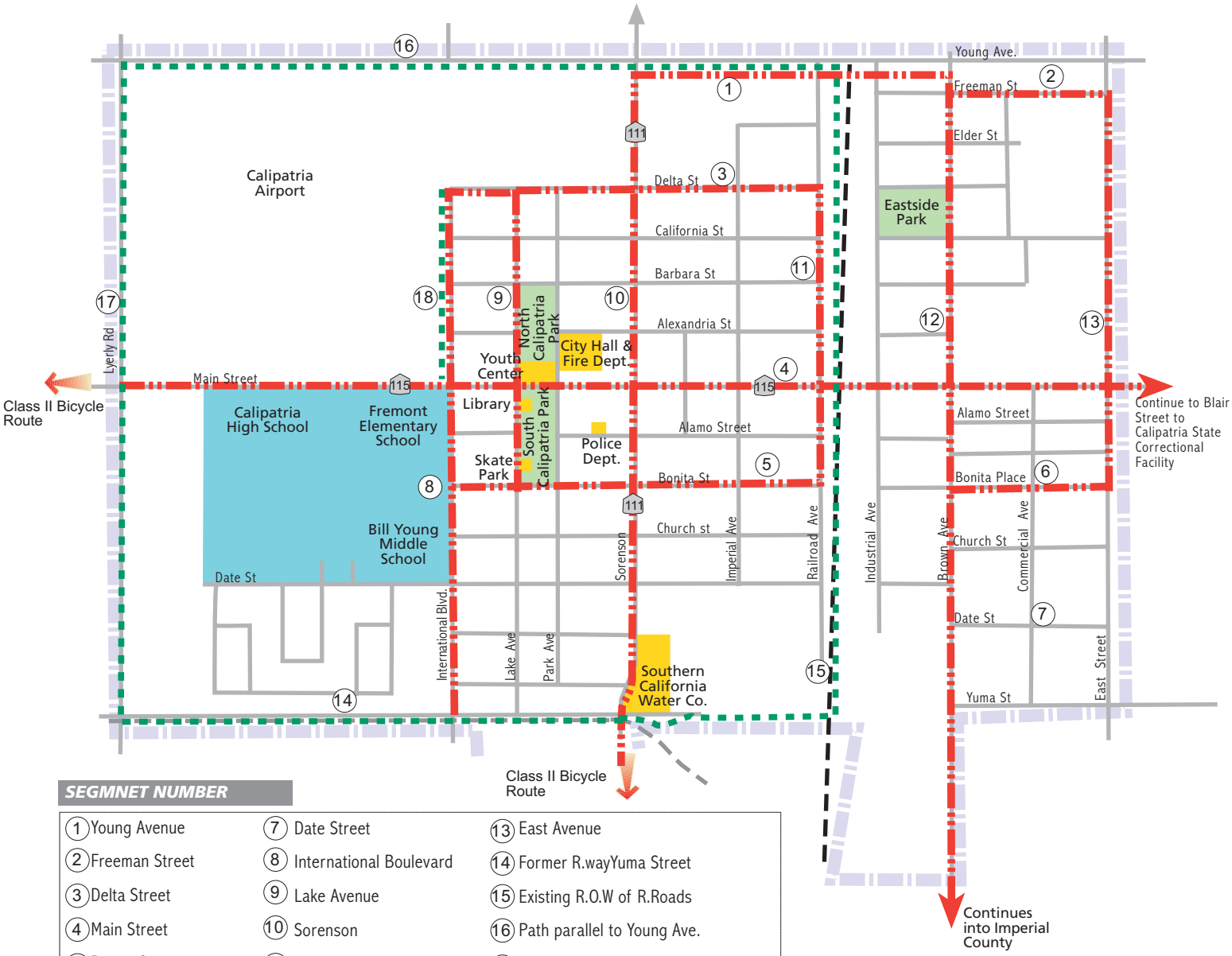
0.25
0.5
0.75
1 Mile



SEGMNET NUMBER

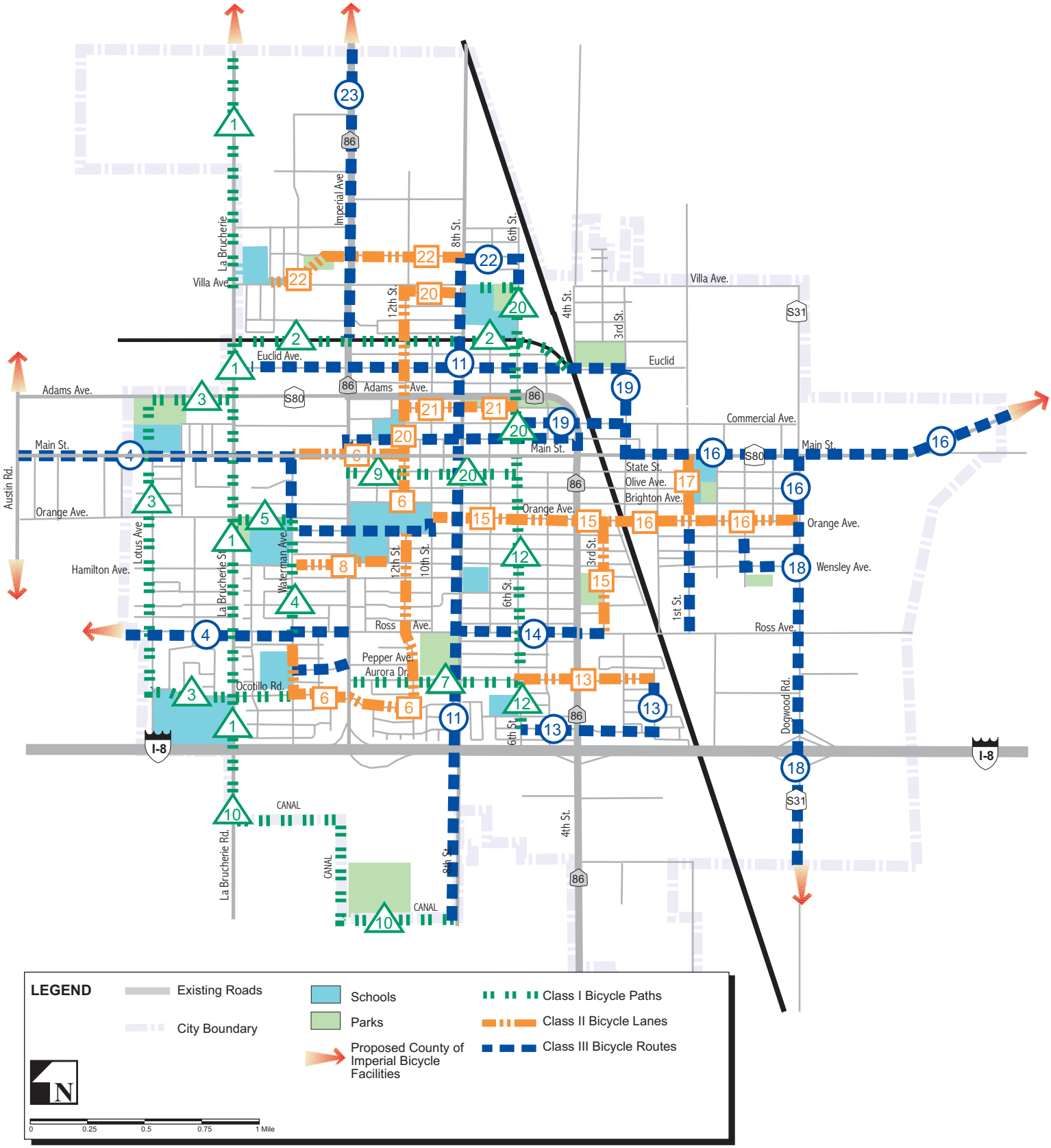
1 Young Avenue	7 Date Street	13 East Avenue
2 Freeman Street	8 International Boulevard	14 Former R.wayYuma Street
3 Delta Street	9 Lake Avenue	15 Existing R.O.W of R.Roads
4 Main Street	10 Sorenson	16 Path parallel to Young Ave.
5 Bonita Street	11 Railroad Avenue	17 Path along Lyerly Road
6 Bonita Place	12 Brown Avenue	

LEGEND

- Schools
- Parks / Open Space
- Community Facilities
- Class I Bicycle Path
- Class II Bicycle Facilities
- Southern Pacific Railway
- Inactive Railway
- City Boundary
- Bike Routes Proposed in the Imperial County Bicycle Master Plan

N

NOT TO SCALE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4th St.
3rd St.
Euclid
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Adams Ave.
Main St.
Commercial Ave.
State St.
Olive Ave.
Brighton Ave.
Orange Ave.
Austin Rd.
Lotus Ave
Waterman Ave.
Hamilton Ave.
12th St.
10th St.
6th St.
3rd St.
1st St.
Wensley Ave.
Ross Ave.
Pepper Ave.
Aurora Dr.
Ocotillo Rd.
Dogwood Rd.
I-8
CANAL
La Brucherie Rd.
8th St.
4th St.
S80
S31
86
LEGEND
Existing Roads
City Boundary
Schools
Parks
Proposed County of Imperial Bicycle Facilities
Class I Bicycle Paths
Class II Bicycle Lanes
Class III Bicycle Routes
N
0
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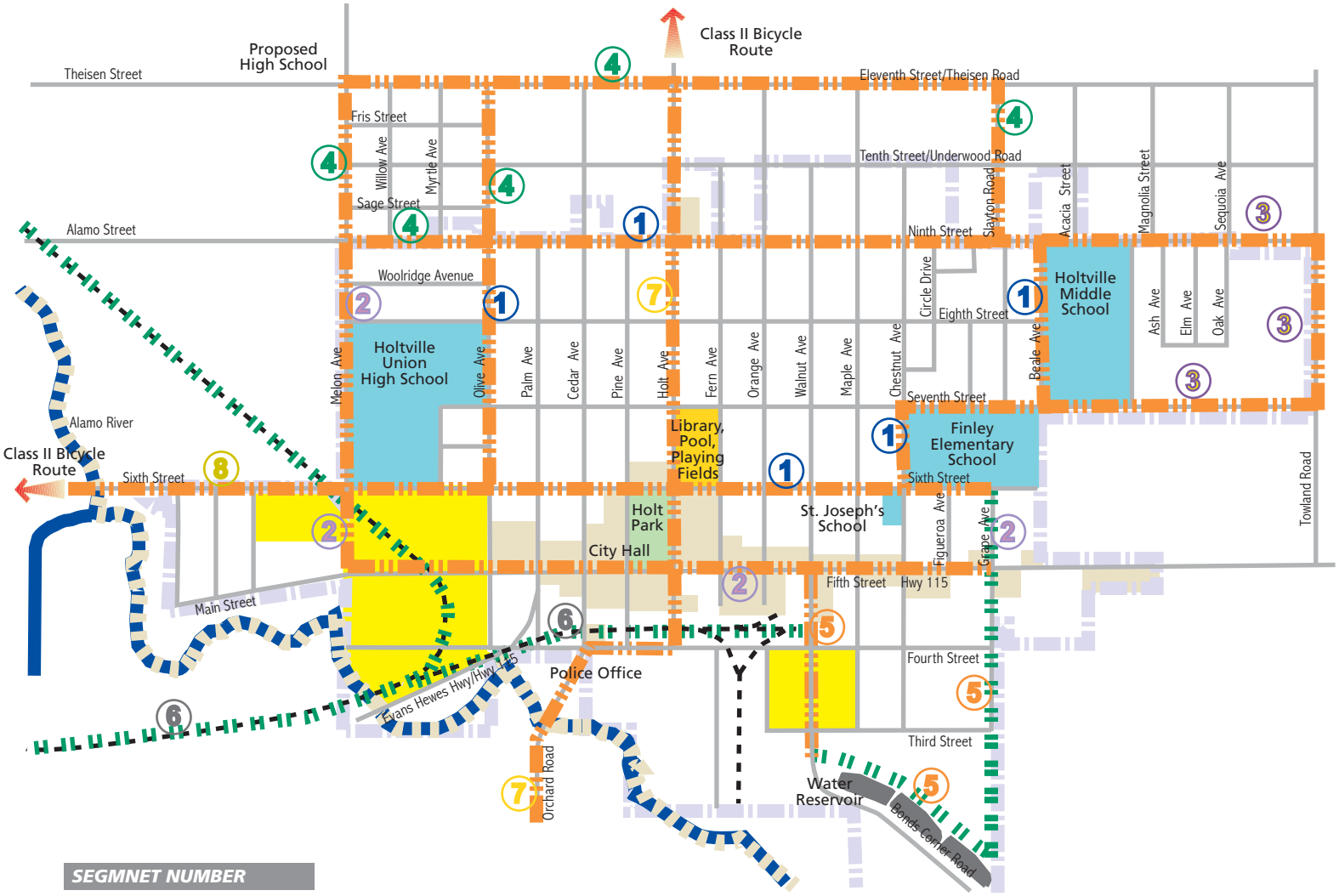
1 Mile



SEGMNET NUMBER

1 Holt Park Road	5 Bonds Corner Route
2 Finley Elementary School Route	6 Railway Route
3 Holtville Middle School Route	7 Holt Avenue Route
4 High School Route	8 Sixth Street Route

LEGEND

- Schools
- Parks / Open Space
- Community Facilities
- Class I Bicycle Path
- Class II Bicycle Routes
- Southern Pacific Railway
- City Boundary
- Bike Lanes Proposed in the Imperial County Bicyle Master Plan
- Hiking Trail

N

NOT TO SCALE

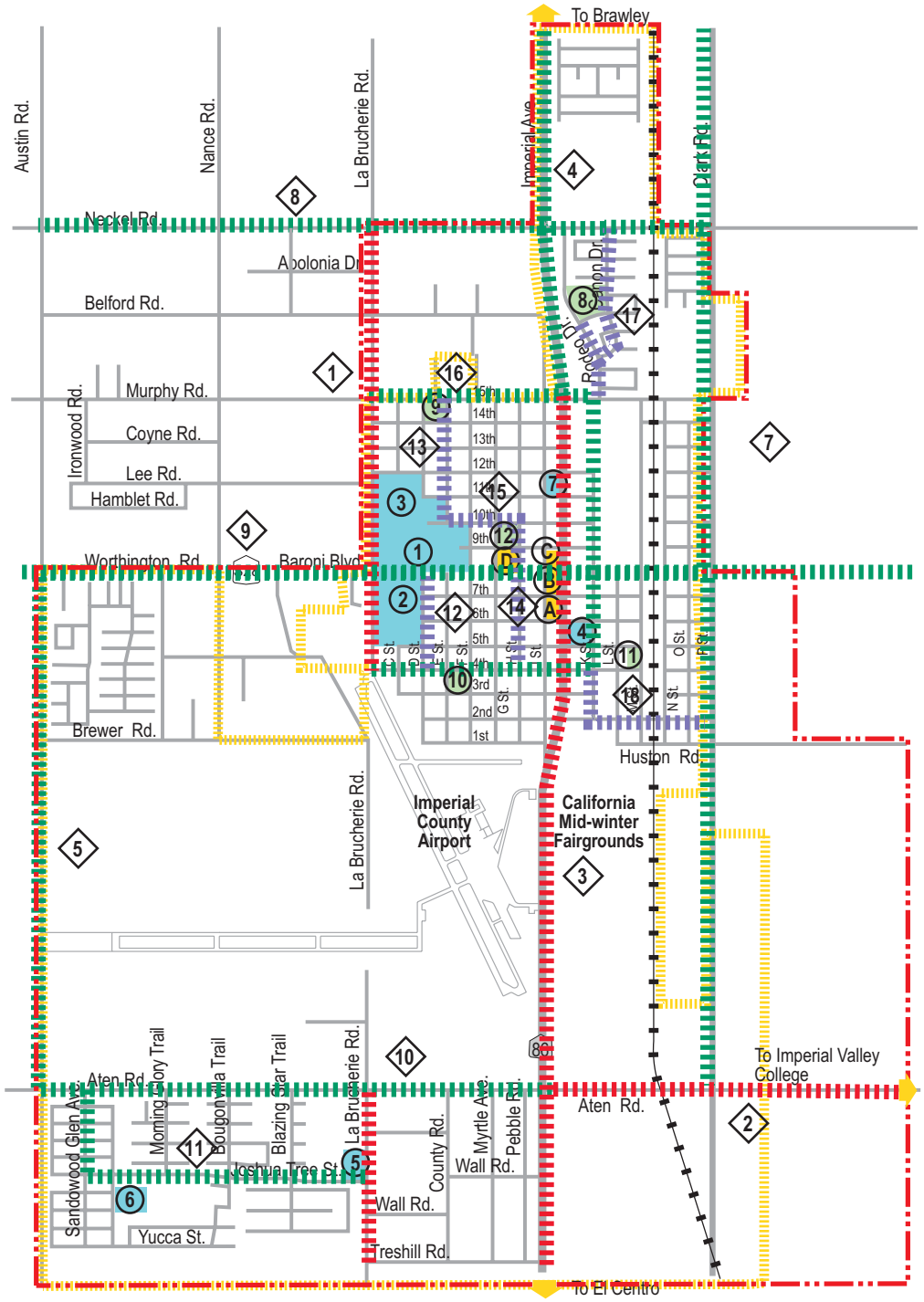
SCHOOLS & PARKS

1. Imperial Union High School
2. Ben Hulse Elementary
3. Frank Wright Junior High School
4. Faith Academy Christian
5. Valley Christian School
6. Elementary School
7. Holbrook High School
8. City Park
9. Irving Park
10. White Park
11. Evans Park
12. Lawrence "Papa A." Eager Park

COMMUNITY FACILITIES

- A City Hall
- B Fire Satation
- C Post Office
- D Library

1 Bicycle Segments

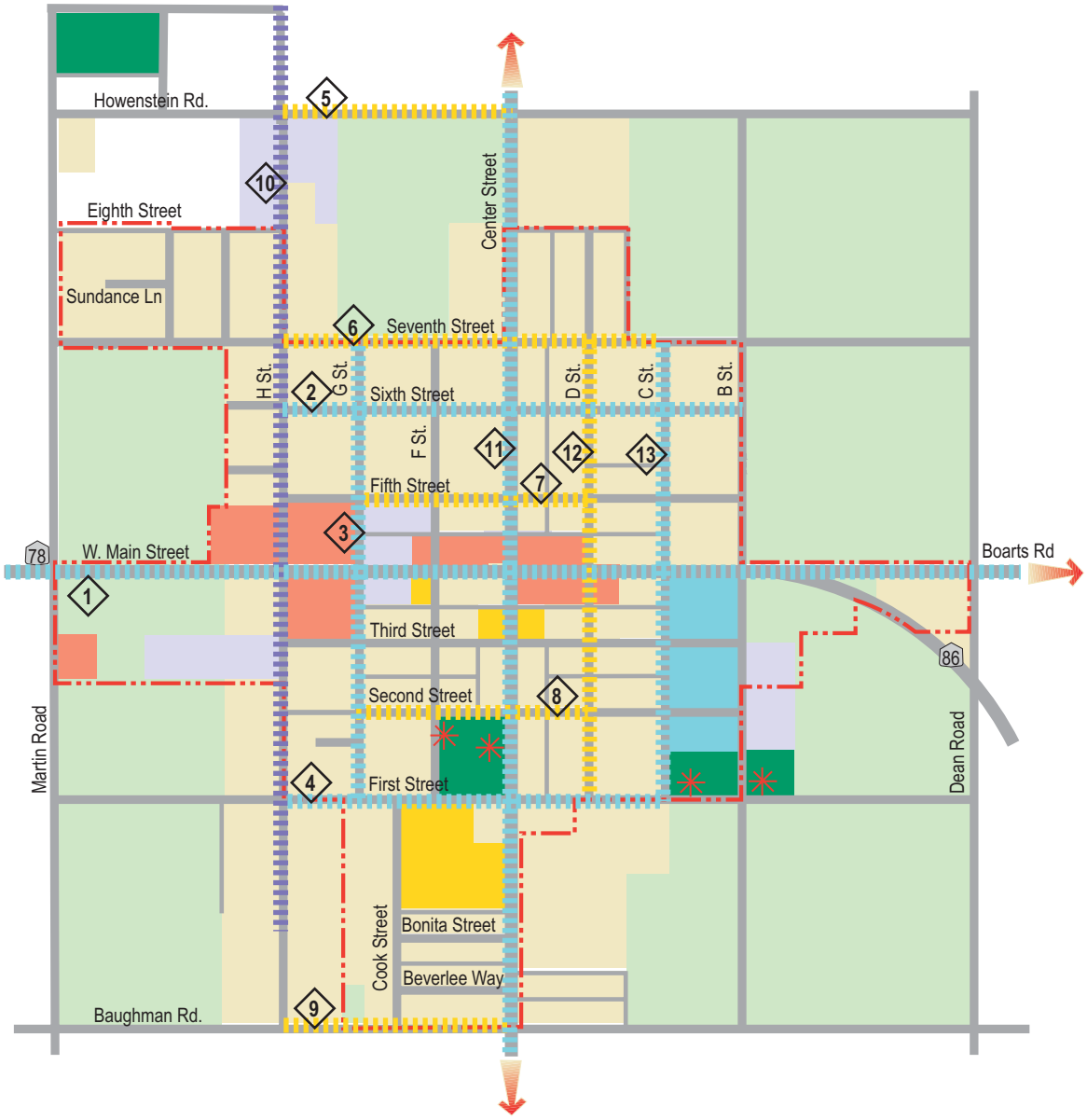


LEGEND

- Schools
- Parks / Open Space
- Community Facilities
- Union Pacific Railway
- Sphere of Influence
- Class I Proposed Bicycle Routes
- Class II Proposed Bicycle Routes
- Class III Proposed Bicycle Routes
- City Boundary

N

0 1/8 1/4 3/8 1/2 Mile



LEGEND

City Boundary
Class I Bicycle Path
Class II Bicycle Path
Class III Bicycle Path

N

0 0.1 0.2 0.3 0.4 Mile

BICYCLE SEGMENTS

1 W. Main Street
2 Sixth Street
3 'G' Street
4 First Street
5 Howenstein Road
6 Seventh Street
7 Fifth Street
8 Second Street
9 Baughman Road
10 'H' Street
11 Center Street
12 'D' Street
13 'C' Street
Bicycle Racks

STREETS AND HIGHWAYS CODE
(SECTION 890-894.2)

Bicycle Transportation Plan Preparation and Processing

To be eligible for Bicycle transportation Account funds, cities/counties must prepare and adopt a Bicycle Transportation Plan (BTP) that addresses items a. – k. in Streets and Highways Code Section 891.2 (attached).

Following adoption, the city or county sends the plan to the appropriate regional transportation planning (RTPA) agency for approval. Following RTPA approval, the local agency provides the plan to the Bicycle Facilities Unit for review to ensure the plan addresses the required elements.

Bicycle Program staff employs a "checklist" approach to BTP review, to determine if the plan includes the required elements. The review does not "grade" the information provided in the discussion of the required elements. Each required element should be addressed in the plan, regardless of applicability to the local agency preparing the plan.

The following are examples of acceptable discussions of required elements that might not be fully applicable to a particular local agency:

Item ***(c) A map and description of existing and proposed bikeways***. If the local agency has no existing bikeways, a response to that affect and a discussion of planned bikeways would be acceptable. Accompanying maps should show proposed bikeways.

Item ***(d) A map and description of existing and proposed end-of-trip bicycle parking facilities. These shall include, but not be limited to, parking at schools, shopping centers, public buildings, and major employment centers.*** If there are bike racks at all schools in the community, and additional facilities are planned at the mall and the bus depot, the plan discussion of this element should describe the current condition and describe the future plans. The accompanying maps should show the locations of the schools, the mall, and the bus depot.

Local agencies have successfully employed various approaches to ensuring that their plan addresses the required elements and that the location of the information is apparent to the reviewer:

- Mirroring items a. – k. in the plan's Table of Contents (especially if the sole purpose of the BTP is to qualify for Bicycle Transportation Account (BTA) funding.)

- Adding a supplement that focuses on items a. – k. (some agencies have employed a question and answer format stating the element and responding with the applicable discussion.)

- Including a page that identifies the locations in the plan where the reviewer will find discussions of the required elements.

Under the current program guidelines, approved BTPs are valid for four years.

Bicycle Facilities Unit staff in the Headquarters Division of Local Assistance are available to assist local agencies with interpretation of the BTA guidelines.

Ken McGuire (916) 653-2750 ken.mcguire@dot.ca.gov
David Priebe (916) 653-0036 david.priebe@dot.ca.gov

Streets and Highways Code provisions concerning Bicycle Transportation Plans

891.2. A city or county may prepare a bicycle transportation plan, which shall include, but not be limited to, the following elements:

(a) The estimated number of existing bicycle commuters in the plan area and the estimated increase in the number of bicycle commuters resulting from implementation of the plan.

(b) A map and description of existing and proposed land use and settlement patterns which shall include, but not be limited to, locations of residential neighborhoods, schools, shopping centers, public buildings, and major employment centers.

(c) A map and description of existing and proposed bikeways.

(d) A map and description of existing and proposed end-of-trip bicycle parking facilities. These shall include, but not be limited to, parking at schools, shopping centers, public buildings, and major employment centers.

(e) A map and description of existing and proposed bicycle transport and parking facilities for connections with and use of other transportation modes. These shall include, but not be limited to, parking facilities at transit stops, rail and transit terminals, ferry docks and landings, park and ride lots, and provisions for transporting bicyclists and bicycles on transit or rail vehicles or ferry vessels.

(f) A map and description of existing and proposed facilities for changing and storing clothes and equipment. These shall include, but not be limited to, locker, restroom, and shower facilities near bicycle parking facilities.

(g) A description of bicycle safety and education programs conducted in the area included within the plan, efforts by the law enforcement agency having primary traffic law enforcement responsibility in the area to enforce provisions of the Vehicle Code pertaining to bicycle operation, and the resulting effect on accidents involving bicyclists.

(h) A description of the extent of citizen and community involvement in development of the plan, including, but not limited to, letters of support.

(i) A description of how the bicycle transportation plan has been coordinated and is consistent with other local or regional transportation, air quality, or energy conservation plans, including, but not limited to, programs that provide incentives for bicycle commuting.

(j) A description of the projects proposed in the plan and a listing of their priorities for implementation.

(k) A description of past expenditures for bicycle facilities and future financial needs for projects that improve safety and convenience for bicycle commuters in the plan area.

891.4. (a) A city or county that has prepared a bicycle transportation plan pursuant to Section 891.2 may submit the plan to the county transportation commission or transportation planning agency for approval. The city or county may submit an approved plan to the department in connection with an application for funds for bikeways and related facilities which will implement the plan. If the bicycle transportation plan is prepared, and the facilities are proposed to be constructed, by a local agency other than a city or county, the city or county may submit the plan for approval and apply for funds on behalf of that local agency.

CALTRANS CHAPTER 1000

BIKEWAY PLANNING AND DESIGN

CHAPTER 1000
BIKEWAY PLANNING AND DESIGN

Topic 1001 - General Information

Index 1001.1 - Definitions

"Bikeway" means all facilities that provide primarily for bicycle travel.

(1) Class I Bikeway (Bike Path). Provides a completely separated right of way for the exclusive use of bicycles and pedestrians with crossflow minimized.

(2) Class II Bikeway (Bike Lane). Provides a striped lane for one-way bike travel on a street or highway.

(3) Class III Bikeway (Bike Route). Provides for shared use with pedestrian or motor vehicle traffic.

1001.2 Streets and Highways Code References - Chapter 8 - Nonmotorized Transportation

(a) Section 887 -- Definition of nonmotorized facility.

(b) Section 887.6 -- Agreements with local agencies to construct and maintain nonmotorized facilities.

(c) Section 887.8 -- Payment for construction and maintenance of nonmotorized facilities approximately paralleling state highways.

(d) Section 888 -- Severance of existing major nonmotorized route by freeway construction.

(e) Section 888.2 -- Incorporation of non-motorized facilities in the design of freeways.

(f) Section 888.4 -- Requires Caltrans to budget not less than $360,000 annually for nonmotorized facilities used in conjunction with the state highway system.

(g) Section 890.4 -- Class I, II, and III bike-way definitions.

(h) Section 890.6 - 890.8 -- Caltrans and local agencies to develop design criteria and symbols for signs, markers, and traffic control devices for bikeways and roadways where bicycle travel is permitted.

(i) Section 891 -- Local agencies must comply with design criteria and uniform symbols.

(j) Section 892 -- Use of abandoned right-of-way as a nonmotorized facility.

1001.3 Vehicle Code References - Bicycle Operation

(a) Section 21200 -- Bicyclist's rights and responsibilities for traveling on highways.

(b) Section 21202 -- Bicyclist's position on roadways when traveling slower than the normal traffic speed.

(c) Section 21206 -- Allows local agencies to regulate operation of bicycles on pedestrian or bicycle facilities.

(d) Section 21207 -- Allows local agencies to establish bike lanes on non-state highways.

(e) Section 21207.5 -- Prohibits motorized bicycles on bike paths or bike lanes.

(f) Section 21208 -- Specifies permitted movements by bicyclists from bike lanes.

(g) Section 21209 -- Specifies permitted movements by motorists in bike lanes.

(h) Section 21210 -- Prohibits bicycle parking on sidewalks unless pedestrians have an adequate path.

(i) Section 21211 -- Prohibits impeding or obstruction of bicyclists on bike paths.

(j) Section 21212 -- Requires a bicyclist under 18 years of age to wear an approved helmet.

(k) Section 21717 -- Requires a motorist to drive in a bike lane prior to making a turn.

(l) Section 21960 -- Use of freeway shoulders by bicyclists.

Topic 1002 - General Planning Criteria

1002.1 Introduction

The needs of non-motorized transportation must be considered on all highway projects. Topic 105 discusses Pedestrian Facilities with Index 105.3 addressing accessibility needs. This chapter discusses bicycle travel.

Bicycle travel can be enhanced by improved maintenance and by upgrading existing roads used regularly by bicyclists, regardless of whether or not bikeways are designated. This effort requires increased attention to the right-hand portion of roadways where bicyclists are expected to ride. On new construction, and major reconstruction projects, adequate width should be provided to permit shared use by motorists and bicyclists. **On resurfacing projects, the entire paved shoulder and traveled way shall be resurfaced. When adding lanes or turn pockets, a minimum 1.2 m shoulder shall be provided (see Topic 405 and Table 302.1).** When feasible, a wider shoulder should be considered. When placing a roadway edge stripe, sufficient room outside the stripe should be provided for bicyclists. When considering the restriping of roadways for more traffic lanes, the impact on bicycle travel should be assessed. Bicycle and pedestrian traffic through construction zones should be addressed in the project development process. These efforts, to preserve or improve an area for bicyclists to ride, can benefit motorists as well as bicyclists.

1002.2 The Role of Bikeways

Bikeways are one element of an effort to improve bicycling safety and convenience - either to help accommodate motor vehicle and bicycle traffic on shared roadways, or to complement the road system to meet needs not adequately met by roads.

Off-street bikeways in exclusive corridors can be effective in providing new recreational opportunities, or in some instances, desirable commuter routes. They can also be used to close gaps where barriers exist to bicycle travel (e.g., river crossing). On-street bikeways can serve to enhance safety and convenience, especially if other commitments are made in conjunction with establishment of bikeways, such as: elimination of parking or increasing roadway width, elimination of surface irregularities and roadway obstacles, frequent street sweeping, establishing intersection priority on the bike route street as compared with the majority of cross streets, and installation of bicycle-sensitive loop detectors at signalized intersections.

1002.3 The Decision to Develop Bikeways

The decision to develop bikeways should be made with the knowledge that bikeways are not the solution to all bicycle-related problems. Many of the common problems are related to improper bicyclist and motorist behavior and can only be corrected through effective education and enforcement programs. The development of well conceived bikeways can have a positive effect on bicyclist and motorist behavior. Conversely, poorly conceived bikeways can be counterproductive to education and enforcement programs.

1002.4 Selection of the Type of Facility

The type of facility to select in meeting the bicycle need is dependent on many factors, but the following applications are the most common for each type.

(1) Shared Roadway (No Bikeway Designation). Most bicycle travel in the State now occurs on streets and highways without bikeway designations. This probably will be true in the future as well. In some instances, entire street systems may be fully adequate for safe and efficient bicycle travel, and signing and striping for bicycle use may be unnecessary. In other cases, routes may be unsuitable for bicycle travel, and it would be inappropriate to encourage additional bicycle travel by designating the routes as bikeways. Finally, routes may not be along high bicycle demand corridors, and it would be inappropriate to designate bikeways regardless of roadway conditions (e.g., on minor residential streets).

Many rural highways are used by touring bicyclists for intercity and recreational travel.

In most cases, it would be inappropriate to designate the highways as bikeways because of the limited use and the lack of continuity with other bike routes. However, the development and maintenance of 1.2 m paved roadway shoulders with a standard 100 mm edge stripe can significantly improve the safety and convenience for bicyclists and motorists along such routes.

(2) Class I Bikeway (Bike Path). Generally, bike paths should be used to serve corridors not served by streets and highways or where wide right of way exists, permitting such facilities to be constructed away from the influence of parallel streets. Bike paths should offer opportunities not provided by the road system. They can either provide a recreational opportunity, or in some instances, can serve as direct high-speed commute routes if cross flow by motor vehicles and pedestrian conflicts can be minimized. The most common applications are along rivers, ocean fronts, canals, utility right of way, abandoned railroad right of way, within college campuses, or within and between parks. There may also be situations where such facilities can be provided as part of planned developments. Another common application of Class I facilities is to close gaps to bicycle travel caused by construction of freeways or because of the existence of natural barriers (rivers, mountains, etc.).

(3) Class II Bikeway (Bike Lane). Bike lanes are established along streets in corridors where there is significant bicycle demand, and where there are distinct needs that can be served by them. The purpose should be to improve conditions for bicyclists in the corridors. Bike lanes are intended to delineate the right of way assigned to bicyclists and motorists and to provide for more predictable movements by each. But a more important reason for constructing bike lanes is to better accommodate bicyclists through corridors where insufficient room exists for safe bicycling on existing streets. This can be accomplished by reducing the number of lanes, or prohibiting parking on given streets in order to delineate bike lanes. In addition, other things can be done on bike lane streets to improve the situation for bicyclists, that might not be possible on all streets (e.g., improvements to the surface, augmented sweeping programs, special signal facilities, etc.). Generally, stripes alone will not measurably enhance bicycling.

If bicycle travel is to be controlled by delineation, special efforts should be made to assure that high levels of service are provided with these lanes.

In selecting appropriate streets for bike lanes, location criteria discussed in the next section should be considered.

(4) Class III Bikeway (Bike Route). Bike routes are shared facilities which serve either to:

(a) Provide continuity to other bicycle facilities (usually Class II bikeways); or

(b) Designate preferred routes through high demand corridors.

As with bike lanes, designation of bike routes should indicate to bicyclists that there are particular advantages to using these routes as compared with alternative routes. This means that responsible agencies have taken actions to assure that these routes are suitable as shared routes and will be maintained in a manner consistent with the needs of bicyclists. Normally, bike routes are shared with motor vehicles. The use of sidewalks as Class III bikeways is strongly discouraged.

It is emphasized that the designation of bikeways as Class I, II and III should not be construed as a hierarchy of bikeways; that one is better than the other. Each class of bikeway has its appropriate application.

In selecting the proper facility, an overriding concern is to assure that the proposed facility will not encourage or require bicyclists or motorists to operate in a manner that is inconsistent with the rules of the road.

An important consideration in selecting the type of facility is continuity. Alternating segments of Class I and Class II (or Class III) bikeways along a route are generally incompatible, as street crossings by bicyclists are required when

the route changes character. Also, wrong-way bicycle travel will occur on the street beyond the ends of bike paths because of the inconvenience of having to cross the street.

Topic 1003 - Design Criteria

1003.1 Class I Bikeways

Class I bikeways (bike paths) are facilities with exclusive right of way, with cross flows by motorists minimized. Section 890.4 of the Streets and Highways Code describes Class I bikeways as serving "the exclusive use of bicycles and pedestrians". However, experience has shown that if significant pedestrian use is anticipated, separate facilities for pedestrians are necessary to minimize conflicts. Dual use by pedestrians and bicycles is undesirable, and the two should be separated wherever possible.

Sidewalk facilities are not considered Class I facilities because they are primarily intended to serve pedestrians, generally cannot meet the design standards for Class I bikeways, and do not minimize motorist cross flows. See Index 1003.3 for discussion relative to sidewalk bikeways.

By State law, motorized bicycles ("mopeds") are prohibited on bike paths unless authorized by ordinance or approval of the agency having jurisdiction over the path. Likewise, all motor vehicles are prohibited from bike paths. These prohibitions can be strengthened by signing.

(1) *Widths.* **The minimum paved width for a two-way bike path shall be 2.4 m. The minimum paved width for a one-way bike path shall be 1.5 m. A minimum 0.6 m wide graded area shall be provided adjacent to the pavement (see Figure 1003.1A).** A 1.0 m graded area is recommended to provide clearance from poles, trees, walls, fences, guardrails, or other lateral obstructions. A wider graded area can also serve as a jogging path. Where the paved width is wider than the minimum required, the graded area may be reduced accordingly; however, the graded area is a desirable feature regardless of the paved width. Development of a one-way bike path should be undertaken only after careful consideration due to the problems of enforcing one-way operation and the difficulties in maintaining a path of restricted width.

Where heavy bicycle volumes are anticipated and/or significant pedestrian traffic is expected, the paved width of a two-way path should be greater than 2.4 m, preferably 3.6 m or more. Another important factor to consider in determining the appropriate width is that bicyclists will tend to ride side by side on bike paths, necessitating more width for safe use.

Experience has shown that paved paths less than 3.6 m wide sometimes break up along the edge as a result of loads from maintenance vehicles.

Where equestrians are expected, a separate facility should be provided.

(2) *Clearance to Obstructions.* **A minimum 0.6 m horizontal clearance to obstructions shall be provided adjacent to the pavement (see Figure 1003.1A).** A 1.0 m clearance is recommended. Where the paved width is wider than the minimum required, the clearance may be reduced accordingly; however, an adequate clearance is desirable regardless of the paved width. If a wide path is paved contiguous with a continuous fixed object (e.g., block wall), a 100 mm white edge stripe, 0.3 m from the fixed object, is recommended to minimize the likelihood of a bicyclist hitting it**. The clear width on structures between railings shall be not less than 2.4 m.** It is desirable that the clear width of structures be equal to the minimum clear width of the path (i.e., 3.6 m).

The vertical clearance to obstructions across the clear width of the path shall be a minimum of 2.5 m. Where practical, a vertical clearance of 3 m is desirable.

(3) *Striping and Signing*. A yellow centerline stripe may be used to separate opposing directions of travel. A centerline stripe is particularly beneficial in the following circumstances:

(a) Where there is heavy use;

(b) On curves with restricted sight distance; and,

Figure 1003.1A

Two-Way Bike Path on Separate Right of Way

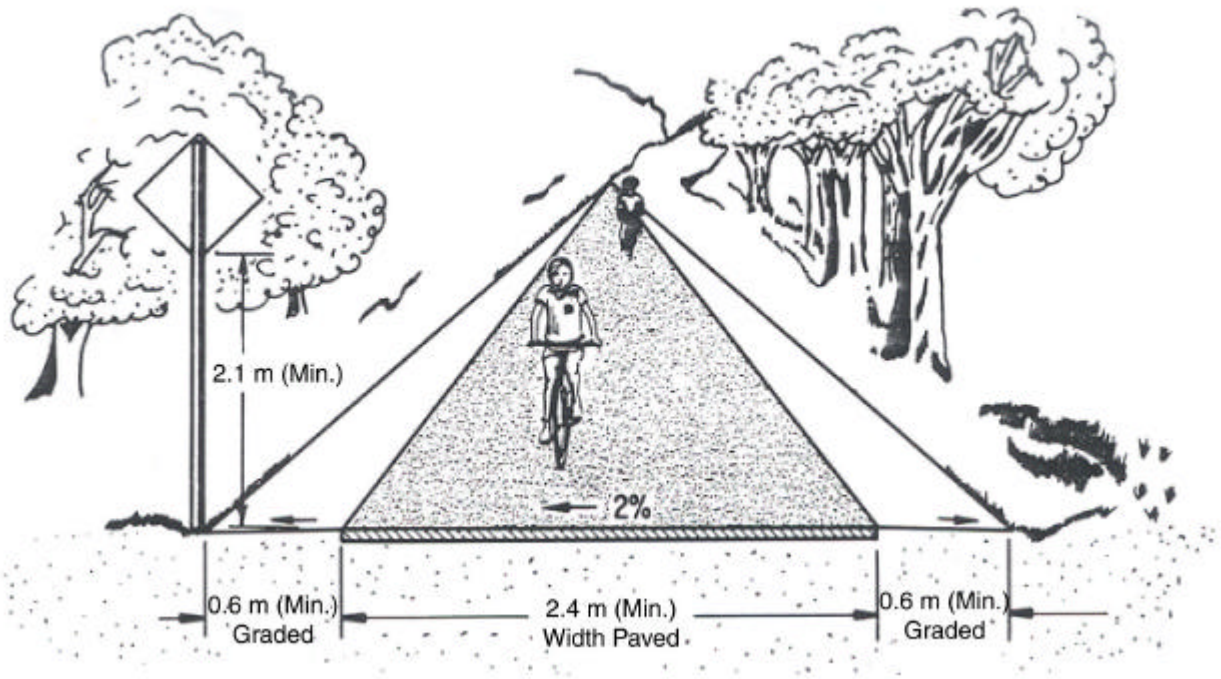
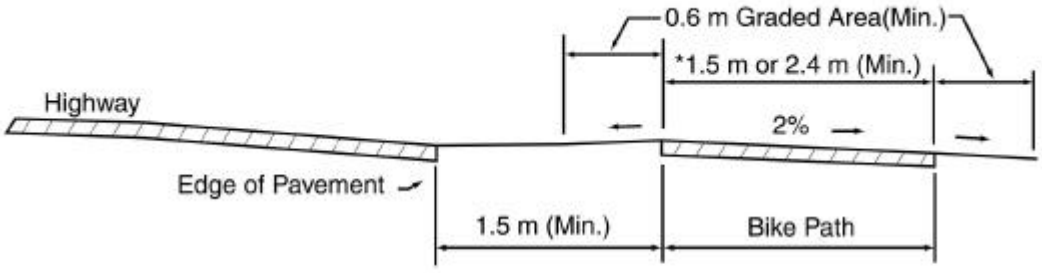


Figure 1003.1A

Typical Cross Section of Bike Path Along HIghway



NOTE: See Index 1003.1(5)

*One - Way: 1.5 m Minimum Width
Two - Way: 2.4 m Minimum Width

(c) Where the path is unlighted and nighttime riding is expected. (Refer to Topic 1004 for signing and striping details.)

(4) Intersections with Highways. Intersections are a prime consideration in bike path design. If alternate locations for a bike path are available, the one with the most favorable intersection conditions should be selected.

Where motor vehicle cross traffic and bicycle traffic is heavy, grade separations are desirable to eliminate intersection conflicts. Where grade separations are not feasible, assignment of right of way by traffic signals should be considered. Where traffic is not heavy, stop or yield signs for bicyclists may suffice.

Bicycle path intersections and approaches should be on relatively flat grades. Stopping sight distances at intersections should be checked and adequate warning should be given to permit bicyclists to stop before reaching the intersection, especially on downgrades.

When crossing an arterial street, the crossing should either occur at the pedestrian crossing, where motorists can be expected to stop, or at a location completely out of the influence of any intersection to permit adequate opportunity for bicyclists to see turning vehicles. When crossing at midblock locations, right of way should be assigned by devices such as yield signs, stop signs, or traffic signals which can be activated by bicyclists. Even when crossing within or adjacent to the pedestrian crossing, stop or yield signs for bicyclists should be placed to minimize potential for conflict resulting from turning autos. Where bike path stop or yield signs are visible to approaching motor vehicle traffic, they should be shielded to avoid confusion. In some cases, Bike Xing signs may be placed in advance of the crossing to alert motorists. Ramps should be installed in the curbs, to preserve the utility of the bike path. Ramps should be the same width as the bicycle paths. Curb cuts and ramps should provide a smooth transition between the bicycle paths and the roadway.

(5) Separation Between Bike Paths and Highways. A wide separation is recommended between bike paths and adjacent highways (see Figure 1003.1B). **Bike paths closer than 1.5 m from the edge of the shoulder shall include a physical barrier to prevent bicyclists from encroaching onto the highway. Bike paths within the clear recovery zone of freeways shall include a physical barrier separation.** Suitable barriers could include chain link fences or dense shrubs. Low barriers (e.g., dikes, raised traffic bars) next to a highway are not recommended because bicyclists could fall over them and into oncoming automobile traffic. In instances where there is danger of motorists encroaching into the bike path, a positive barrier (e.g., concrete barrier, steel guardrailing) should be provided. See Index 1003.6 for criteria relative to bike paths carried over highway bridges.

Bike paths immediately adjacent to streets and highways are not recommended. They should not be considered a substitute for the street, because many bicyclists will find it less convenient to ride on these types of facilities as compared with the streets, particularly for utility trips.

(6) Bike Paths in the Median of Highways. As a general rule, bike paths in the median of highways are not recommended because they require movements contrary to normal rules of the road. Specific problems with such facilities include:

(a) Bicyclist right turns from the center of roadways are unnatural for bicyclists and confusing to motorists.

(b) Proper bicyclist movements through intersections with signals are unclear.

(c) Left-turning motorists must cross one direction of motor vehicle traffic and two directions of bicycle traffic, which increases conflicts.

(d) Where intersections are infrequent, bicyclists will enter or exit bike paths at midblock.

(e) Where medians are landscaped, visual relationships between bicyclists and motorists at intersections are impaired.

For the above reasons, bike paths in the median of highways should be considered only when the above problems can be avoided. **Bike paths shall not be designed in the medians of freeways or expressways.**

(7) Design Speed. The proper design speed for a bike path is dependent on the expected type of use and on the terrain. **The minimum design speed for bike paths shall be 40 km/h except as noted in Table 1003.1.**

Table 1003.1

Bike Path Design Speeds

Type of Facility	Design Speed (km/h)
Bike Paths with Mopeds Prohibited	40
Bike Paths with Mopeds Permitted	50
Bike Paths on Long Downgrades (steeper than 4%, and longer than 150 m)	50

Installation of "speed bumps" or other similar surface obstructions, intended to cause bicyclists to slow down in advance of intersections or other geometric constraints, shall not be used. These devices cannot compensate for improper design.

(8) Horizontal Alignment and Superelevation. The minimum radius of curvature negotiable by a bicycle is a function of the superelevation rate of the bicycle path surface, the coefficient of friction between the bicycle tires and the bicycle path surface, and the speed of the bicycle.

For most bicycle path applications the superelevation rate will vary from a minimum of 2 percent (the minimum necessary to encourage adequate drainage) to a maximum of approximately 5 percent (beyond which maneuvering difficulties by slow bicyclists and adult tricyclists might be expected). A straight 2% cross slope is recommended on tangent sections. The minimum superelevation rate of 2% will be adequate for most conditions and will simplify construction. Superelevation rates steeper than 5 percent should be avoided on bike paths expected to have adult tricycle traffic.

The coefficient of friction depends upon speed; surface type, roughness, and condition; tire type and condition; and whether the surface is wet or dry. Friction factors used for design should be selected based upon the point at which centrifugal force causes the bicyclist to recognize a feeling of discomfort and instinctively act to avoid higher speed. Extrapolating from values used in highway design, design friction factors for paved bicycle paths can be assumed to vary from 0.31 at 20 km/h to 0.21 at 50 km/h. Although there is no data available for unpaved surfaces, it is suggested that friction factors be reduced by 50 percent to allow a sufficient margin of safety.

The minimum radius of curvature can be selected from Figure 1003.1C. When curve radii smaller than those shown in Figure 1003.1C must be used on bicycle paths because of right of way, topographical or other considerations, standard curve warning signs and supplemental pavement markings should be installed. The negative effects of nonstandard curves can also be partially offset by widening the pavement through the curves.

(9) Stopping Sight Distance. To provide bicyclists with an opportunity to see and react to the unexpected, a bicycle path should be designed with adequate stopping sight distances. The distance required to bring a bicycle to a full controlled stop is a function of the bicyclist's perception and brake reaction time, the initial speed of the bicycle, the coefficient of friction between the tires and the pavement, and the braking ability of the bicycle.

Figure 1003.1D indicates the minimum stopping sight distances for various design speeds and grades. For two-way bike paths, the descending direction, that is, where "G" is negative, will control the design.

Figure 1003.1C

Curve Radii & Superelevations

$$R = \frac{V^2}{127\left(\frac{e}{100} + f\right)}$$

where,

R = Minimum radius of curvature (m),

V = Design Speed (km/h),

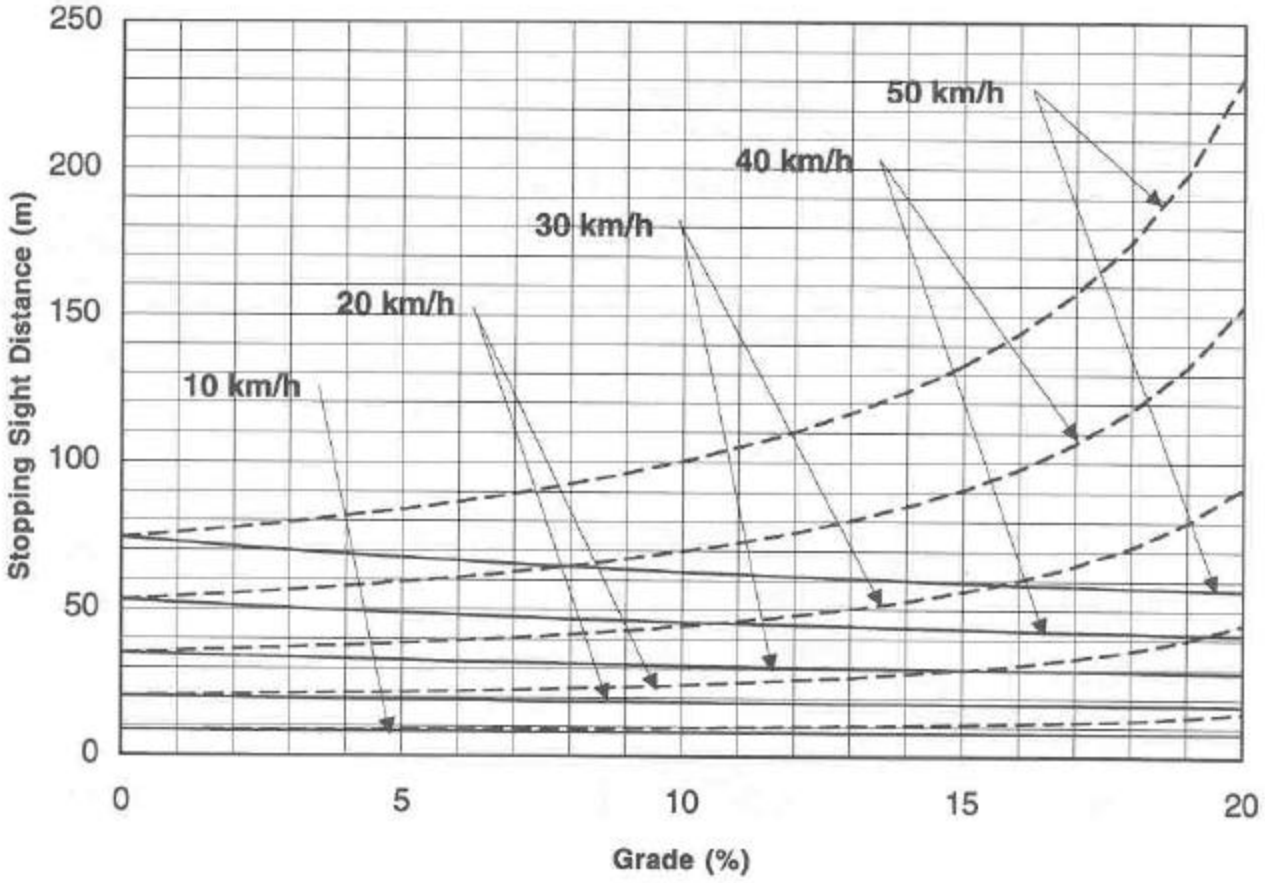
e = Rate of bikeway superelevation, percent

f = Coefficient of friction

Design Speed-V (km/h)	Friction Factor-f	Superelevation-e (%)	Minimum Radius-R (m)
20	0.31	2	10
30	0.28	2	24
40	0.25	2	47
50	0.21	2	86
20	0.31	3	9
30	0.28	3	23
40	0.25	3	45
50	0.21	3	82
20	0.31	4	9
30	0.28	4	22
40	0.25	4	43
50	0.21	4	79
20	0.31	5	9
30	0.28	5	21
40	0.25	5	42
50	0.21	5	76

Figure 1003.1D

Stopping Sight Distance



$$S = \frac{V^2}{254\,(f \pm G)} + \frac{V}{1.4}$$

Descend - - - - - -
Ascend ———

Where : S = stopping sight, m

V = velocity, km/h

f = coefficient of friction (use 0.25)

G = grade, m/m (rise/run)

(10) Length of Crest Vertical Curves. Figure 1003.1E indicates the minimum lengths of crest vertical curves for varying design speeds.

(11) Lateral Clearance on Horizontal Curves. Figure 1003.1F indicates the minimum clearances to line of sight obstructions for horizontal curves. The required lateral clearance is obtained by entering Figure 1003.1F with the stopping sight distance from Figure 1003.1D and the proposed horizontal curve radius.

Bicyclists frequently ride abreast of each other on bicycle paths, and on narrow bicycle paths, bicyclists have a tendency to ride near the middle of the path. For these reasons, and because of the serious consequences of a head on bicycle accident, lateral clearances on horizontal curves should be calculated based on the sum of the stopping sight distances for bicyclists traveling in opposite directions around the curve. Where this is not possible or feasible, consideration should be given to widening the path through the curve, installing a yellow center stripe, installing a curve ahead warning sign, or some combination of these alternatives.

(12) Grades. Bike paths generally attract less skilled bicyclists, so it is important to avoid steep grades in their design. Bicyclists not physically conditioned will be unable to negotiate long, steep uphill grades. Since novice bicyclists often ride poorly maintained bicycles, long downgrades can cause problems. For these reasons, bike paths with long, steep grades will generally receive very little use. The maximum grade rate recommended for bike paths is 5%. It is desirable that sustained grades be limited to 2% if a wide range of riders is to be accommodated. Steeper grades can be tolerated for short segments (e.g., up to about 150 m). Where steeper grades are necessitated, the design speed should be increased and additional width should be provided for maneuverability.

(13) Structural Section. The structural section of a bike path should be designed in the same manner as a highway, with consideration given to the quality of the basement soil and the anticipated loads the bikeway will experience. It is important to construct and maintain a smooth riding surface with skid resistant qualities. Principal loads will normally be from maintenance and emergency vehicles. Expansive soil should be given special consideration and will probably require a special structural section. A minimum pavement thickness of 50 mm of asphalt concrete is recommended. Type "A" or "B" asphalt concrete (as described in Department of Transportation Standard Specifications), with 12.5 mm maximum aggregate and medium grading is recommended. Consideration should be given to increasing the asphalt content to provide increased pavement life. Consideration should also be given to sterilization of basement soil to preclude possible weed growth through the pavement.

At unpaved highway or driveway crossings of bicycle paths, the highway or driveway should be paved a minimum of 3 m on each side of the crossing to reduce the amount of gravel being scattered along the path by motor vehicles. The pavement structure at the crossing should be adequate to sustain the expected loading at that location.

(14) Drainage. For proper drainage, the surface of a bike path should have a cross slope of 2%. Sloping in one direction usually simplifies longitudinal drainage design and surface construction, and accordingly is the preferred practice. Ordinarily, surface drainage from the path will be adequately dissipated as it flows down the gently sloping shoulder. However, when a bike path is constructed on the side of a hill, a drainage ditch of suitable dimensions may be necessary on the uphill side to intercept the hillside drainage. Where necessary, catch basins with drains should be provided to carry intercepted water across the path. Such ditches should be designed in such a way that no undue obstacle is presented to bicyclists.

Culverts or bridges are necessary where a bike path crosses a drainage channel.

Figure 1003.1E

Stopping Sight Distances for Crest Vertical Curves

$L = 2S - \frac{450}{A}$ when $S > L$

$L = \frac{AS^2}{450}$ when $S < L$

Height of cyclist eye - 1400 mm
Height of object - 100 mm

Double line represents S=L
L = Min. length of vertical curve - meters
A = Algebraic grade difference-%
S = Stopping sight distance - meters
V = Design speed km/h (Refer to Figure 1003.1D to determine "V", after "S" is determined.

GIVEN "A" AND "L"; FIND "S"

A (%)	L=50 m S (m)	L=100 m S (m)	L=150 m S (m)	L=200 m S (m)	L=250 m S (m)	L=300 m S (m)
4.5	75					
5	70	95				
5.5	66	90				
6	63	87				
6.5	60	83				
7	57	80	98			
7.5	55	77	95			
8	53	75	92			
8.5	51	73	89	103		
9	50	71	87	100		
9.5	49	69	84	97		
10	47	67	82	95		
10.5	46	65	80	93		
11	45	64	78	90		
11.5	44	63	77	88	99	
12	43	61	75	87	97	
12.5	42	60	73	85	95	
13	42	59	72	83	93	
13.5	41	58	71	82	91	
14	40	57	69	80	90	98
14.5	39	56	68	79	88	96
15	39	55	67	77	87	95

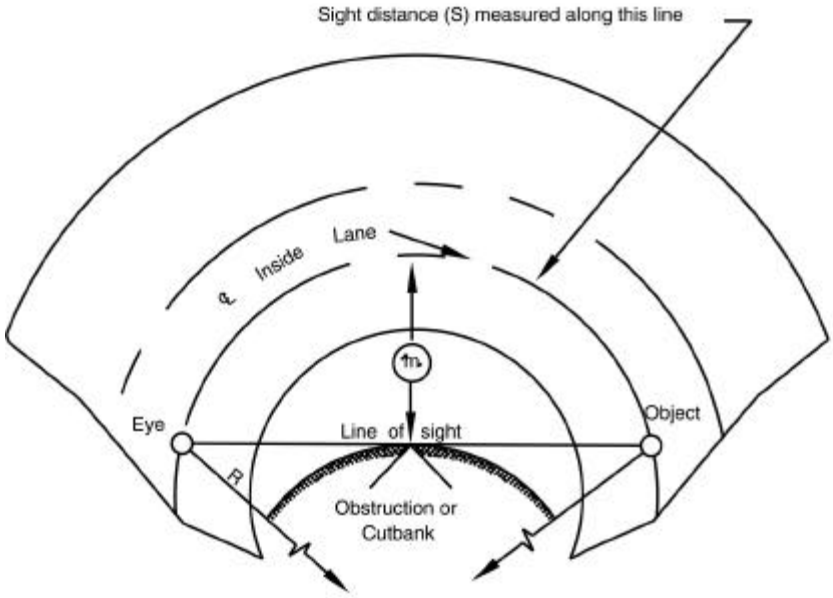
Figure 1003.1E

Stopping Sight Distances for Crest Vertical Curves (continued)

GIVEN "A" AND "S"; FIND "L"

A (%)	S=10 m L (m)	S=15 m L (m)	S=20 m L (m)	S=25 m L (m)	S=30 m L (m)	S=35 m L (m)	S=40 m L (m)	S=45 m L (m)	S=50 m L (m)
5									10.0
6							5.0	15.0	25.0
7						5.7	15.7	25.7	35.7
8					3.8	13.8	23.8	33.8	43.8
9					10.0	20.0	30.0	40.0	50.0
10				5.0	15.0	25.0	35.0	45.0	55.6
11				9.1	19.1	29.1	39.1	49.5	61.1
12			2.5	12.5	22.5	32.5	42.7	54.0	66.7
13			5.4	15.4	25.4	35.4	46.2	58.5	72.2
14			7.9	17.9	27.9	38.1	49.8	63.0	77.8
15			10.0	20.0	30.0	40.8	53.3	67.5	83.3
16		1.9	11.9	21.9	32.0	43.6	56.9	72.0	88.9
17		3.5	13.5	23.5	34.0	46.3	60.4	76.5	94.4
18		5.0	15.0	25.0	36.0	49.0	64.0	81.0	100.0
19		6.3	16.3	26.4	38.0	51.7	67.6	85.5	105.6
20		7.5	17.5	27.8	40.0	54.4	71.1	90.0	111.1
21		8.6	18.6	29.2	42.0	57.2	74.7	94.5	116.7
22		9.5	19.6	30.6	44.0	59.9	78.2	99.0	122.2
23		10.4	20.4	31.9	46.0	62.6	81.8	103.5	127.8
24		11.3	21.3	33.3	48.0	65.3	85.3	108.0	133.3
25		12.0	22.2	34.7	50.0	68.1	88.9	112.5	138.9
26		12.7	23.1	36.1	52.0	70.8	92.4	117.0	144.4
27		13.3	24.0	37.5	54.0	73.5	96.0	121.5	150.0
28	4	13.9	24.9	38.9	56.0	76.2	99.6	126.0	155.6
29	4	14.5	25.8	40.3	58.0	78.9	103.1	130.5	161.1
30	5	15.0	26.7	41.7	60.0	81.7	106.7	135.0	166.7

Figure 1003.1F
Lateral Clearances on Horizontal Curves



S = Sight distance in meters.
R = Radius of ℄ of lane in meters.
m = Distance from ℄ of lane in meters.
V = Design speed for S in km/h.
(Refer to Figure 1003.1D to determine "V", after "S" is determined.)

Angle is expressed in degrees

$$m = R\left[1-\cos\left(\frac{28.65S}{R}\right)\right]$$

$$S = \frac{R}{28.65}\left[\cos^{-1}\left(\frac{R-m}{R}\right)\right]$$

Formula applies only when S is equal to or less than length of curve.

Line of sight is 600 mm above ℄ inside lane at point of obstruction.

GIVEN "R" AND "S"; FIND "m"

R (m)	S=10 m *m* meters	S=20 m *m* meters	S=30 m *m* meters	S=40 m *m* meters	S=50 *m* meters	S=60 m *m* meters	S=70 m *m* meters	S=80 m *m* meters	S=90 m *m* meters	S=100 m *m* meters	S=110 m *m* meters
25	0.50	1.97	4.37	7.58	11.49	15.94	20.75	25.73	30.68	35.41	39.72
50	0.25	1.00	2.23	3.95	6.12	8.73	11.76	15.17	18.92	22.99	27.32
75	0.17	0.67	1.50	2.65	4.13	5.92	8.02	10.42	13.10	16.06	19.28
100	0.12	0.50	1.12	1.99	3.11	4.47	6.06	7.90	9.96	12.24	14.75
125	0.10	0.40	0.90	1.60	2.49	3.58	4.87	6.35	8.01	9.87	11.91
150	0.08	0.33	0.75	1.33	2.08	2.99	4.07	5.30	6.70	8.26	9.97
175	0.07	0.29	0.64	1.14	1.78	2.57	3.49	4.55	5.75	7.10	8.57
200	0.06	0.25	0.56	1.00	1.56	2.25	3.06	3.99	5.04	6.22	7.52
225	0.06	0.22	0.50	0.89	1.39	2.00	2.72	3.55	4.49	5.53	6.69
250	0.05	0.20	0.45	0.80	1.25	1.80	2.45	3.19	4.04	4.98	6.03
275	0.05	0.18	0.41	0.73	1.14	1.63	2.22	2.90	3.67	4.53	5.48
300	0.04	0.17	0.37	0.67	1.04	1.50	2.04	2.66	3.37	4.16	5.03
350	0.04	0.14	0.32	0.57	0.89	1.29	1.75	2.28	2.89	3.57	4.31
400	0.03	0.13	0.28	0.50	0.78	1.12	1.53	2.00	2.53	3.12	3.78
500	0.03	0.10	0.23	0.40	0.62	0.90	1.22	1.60	2.02	2.50	3.02
600	0.02	0.08	0.19	0.33	0.52	0.75	1.02	1.33	1.69	2.08	2.52
700	0.02	0.07	0.16	0.29	0.45	0.64	0.87	1.14	1.45	1.79	2.16
800	0.02	0.06	0.14	0.25	0.39	0.56	0.77	1.00	1.27	1.56	1.89
900	0.01	0.06	0.13	0.22	0.35	0.50	0.68	0.89	1.12	1.39	1.68
1000	0.01	0.05	0.11	0.20	0.31	0.45	0.61	0.80	1.01	1.25	1.51

Figure 1003.1F

Lateral Clearances on Horizontal Curves (continued)

GIVEN "R" AND "m"; FIND "S"

R (m)	*m* = 1 meter	*m* = 2 meters	*m* = 3 meters	*m* = 4 meters	*m* = 5 meters	*m* = 6 meters	*m* = 7 meters	*m* = 8 meters	*m* = 9 meters	*m* = 10 meters	*m* = 11 meters
	S (m)	S (m)	S (m)	S (m)	S (m)	S (m)	S (m)	S (m)	S (m)	S (m)	S (m)
25	14.19	20.13	24.74	28.67	32.17	35.37	38.35	41.15	43.81	46.36	48.82
50	20.03	28.38	34.81	40.27	45.10	49.49	53.55	57.35	60.93	64.35	67.61
75	24.52	34.72	42.57	49.21	55.08	60.40	65.32	69.91	74.23	78.34	82.26
100	28.31	40.06	49.11	56.75	63.51	69.63	75.27	80.54	85.50	90.20	94.68
125	31.64	44.78	54.88	63.41	70.94	77.77	84.06	89.92	95.44	100.67	105.66
150	34.66	49.04	60.10	69.43	77.67	85.13	92.00	98.41	104.44	110.15	115.60
175	37.43	52.96	64.90	74.97	83.86	91.91	99.32	106.23	112.73	118.88	124.75
200	40.01	56.61	69.36	80.13	89.62	98.22	106.13	113.51	120.45	127.01	133.27
225	42.44	60.04	73.56	84.97	95.04	104.15	112.53	120.35	127.70	134.66	141.28
250	44.73	63.28	77.53	89.56	100.16	109.76	118.59	126.82	134.56	141.89	148.86
275	46.91	66.37	81.31	93.92	105.03	115.09	124.35	132.98	141.09	148.77	156.08
300	49.00	69.32	84.92	98.08	109.69	120.19	129.86	138.86	147.33	155.34	162.97
350	52.92	74.86	91.71	105.92	118.45	129.79	140.22	149.94	159.08	167.72	175.95
400	56.58	80.03	98.03	113.22	126.61	138.73	149.87	160.26	170.01	179.25	188.04
500	63.25	89.47	109.59	126.57	141.53	155.06	167.52	179.11	190.01	200.32	210.13
600	69.29	98.00	120.04	138.63	155.02	169.83	183.47	196.16	208.09	219.38	230.12
700	74.84	105.85	129.65	149.73	167.42	183.42	198.14	211.85	224.72	236.91	248.50
800	80.00	113.15	138.60	160.05	178.97	196.07	211.80	226.45	240.21	253.23	265.62
900	84.85	120.01	147.00	169.76	189.81	207.95	224.63	240.16	254.75	268.56	281.69
1000	89.44	126.50	154.95	178.93	200.07	219.18	236.76	253.13	268.51	283.06	296.90

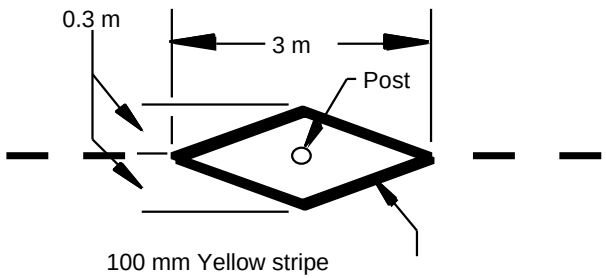
(15) Barrier Posts. It may be necessary to install barrier posts at entrances to bike paths to prevent motor vehicles from entering. When locating such installations, care should be taken to assure that barriers are well marked and visible to bicyclists, day or night (i.e., install reflectors or reflectorized tape).

Striping an envelope around the barriers is recommended (see Figure 1003.1G). If sight distance is limited, special advance warning signs or painted pavement warnings should be provided. Where more than one post is necessary, a 1.5 m spacing should be used to permit passage of bicycle-towed trailers, adult tricycles, and to assure adequate room for safe bicycle passage without dismounting. Barrier post installations should be designed so they are removable to permit entrance by emergency and service vehicles.

Generally, barrier configurations that preclude entry by motorcycles present safety and convenience problems for bicyclists. Such devices should be used only where extreme problems are encountered.

Figure 1003.1G

Barrier Post Striping



(16) Lighting. Fixed-source lighting reduces conflicts along paths and at intersections. In addition, lighting allows the bicyclist to see the bicycle path direction, surface conditions, and obstacles. Lighting for bicycle paths is important and should be considered where riding at night is expected, such as bicycle paths serving college students or commuters, and at highway intersections. Lighting should also be considered through underpasses or tunnels, and when nighttime security could be a problem.

Depending on the location, average maintained horizontal illumination levels of 5 lux to 22 lux should be considered. Where special security problems exist, higher illumination levels may be considered. Light standards (poles) should meet the recommended horizontal and vertical clearances. Luminaires and standards should be at a scale appropriate for a pedestrian or bicycle path.

1003.2 Class II Bikeways

Class II bikeways (bike lanes) for preferential use by bicycles are established within the paved area of highways. Bike lane stripes are intended to promote an orderly flow of traffic, by establishing specific lines of demarcation between areas reserved for bicycles and lanes to be occupied by motor vehicles. This effect is supported by bike lane signs and pavement markings. Bike lane stripes can increase bicyclists' confidence that motorists will not stray into their path of travel if they remain within the bike lane. Likewise, with more certainty as to where bicyclists will be, passing motorists are less apt to swerve toward opposing traffic in making certain they will not hit bicyclists.

Class II bike lanes shall be one-way facilities. Two-way bike lanes (or bike paths that are contiguous to the roadway) are not permitted, as such facilities have proved unsatisfactory and promote riding against the flow of motor vehicle traffic.

(1) Widths. Typical Class II bikeway configurations are illustrated in Figure 1003.2A and are described below:

(a) Figure 1003.2A-(1) depicts bike lanes on an urban type curbed street where parking stalls (or continuous parking stripes) are marked. Bike lanes are located between the parking area and the traffic lanes. **As indicated, 1.5 m shall be the minimum width of bike lane where parking stalls are marked.** If parking volume is substantial or turnover high, an additional 0.3 m to 0.6 m of width is desirable.

Bike lanes shall not be placed between the parking area and the curb. Such facilities increase the conflict between bicyclists and opening car doors and reduce visibility at intersections. Also, they prevent bicyclists from leaving the bike lane to turn left and cannot be effectively maintained.

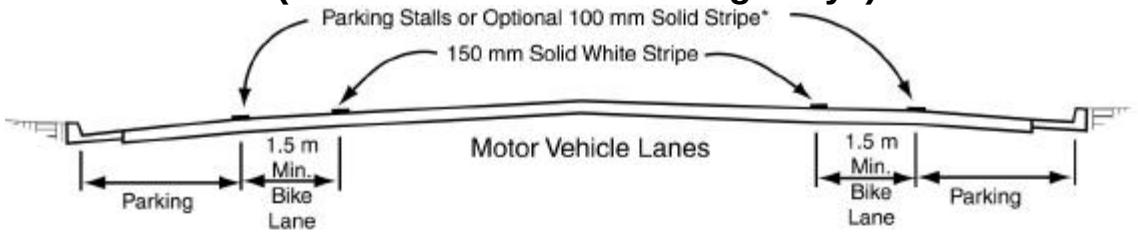
(b) Figure 1003.2A-(2) depicts bike lanes on an urban-type curbed street, where parking is permitted, but without parking stripe or stall marking. Bike lanes are established in conjunction with the parking areas**. As indicated, 3.3 m or 3.6 m (depending on the type of curb) shall be the minimum width of the bike lane where parking is permitted.** This type of lane is satisfacory where parking is not extensive and where turnover of parked cars is infrequent. However, if parking is substantial, turnover of parked cars is high, truck traffic is substantial, or if vehicle speeds exceed 55 km/h, additional width is recommended.

(c) Figure 1003.2A-(3) depicts bike lanes along the outer portions of an urban type curbed street, where parking is prohibited. This is generally the most desirable configuration for bike lanes, as it eliminates potential conflicts resulting from auto parking (e.g., opening car doors). **As indicated, if no gutter exists, the minimum bike lane width shall be 1.2 m. With a normal 600 mm gutter, the minimum bike lane width shall be 1.5 m.** The intent is to provide a minimum 1.2 m wide bike lane, but with at least 0.9 m between the traffic lane and the longitudinal joint at the concrete gutter, since the gutter reduces the effective width of the bike lane for two reasons. First, the longitudinal joint may not always be smooth, and may be difficult to ride along. Secondly, the gutter does not provide a suitable surface for bicycle travel. Where gutters are wide (say, 1.2 m), an additional 0.9 m must be provided because bicyclists should not be expected to ride in the gutter. Wherever possible, the width of bike lanes should be increased to 1.8 to 2.4 m to provide for greater safety. 2.4 m bike lanes can also serve as emergency parking areas for disabled vehicles.

Striping bike lanes next to curbs where parking is prohibited only during certain hours shall be done only in conjunction with special signing to designate the hours bike lanes are to be effective. Since the Vehicle Code requires bicyclists to ride in bike lanes where provided (except under certain conditions), proper signing is necessary to inform bicyclists that they are required to ride in bike lanes only during the course of the parking prohibition. This type of bike lane should be considered only if the vast majority of bicycle travel would occur during the hours of the parking prohibition, and only if there is a firm commitment to enforce the parking prohibition. Because of the obvious complications, this type of bike lane is not encouraged for general application.

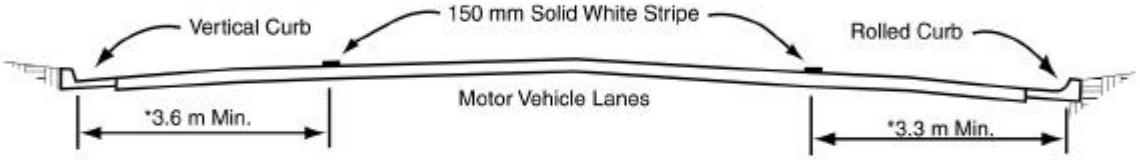
Figure 1003.2A(4) depicts bike lanes on a highway without curbs and gutters. This location is in an undeveloped area where infrequent parking is handled off the pavement. This can be accomplished by supplementing the bike lane signing with R25 (park off pavement) signs, or R26 (no parking) signs. **Minimum widths shall be as shown.** Additional width is desirable, particularly where motor vehicle speeds exceed 55 km/h.

Figure 1003.2A
Typical Bike Lane Cross Sections
(On 2-lane or Multilane Highways)



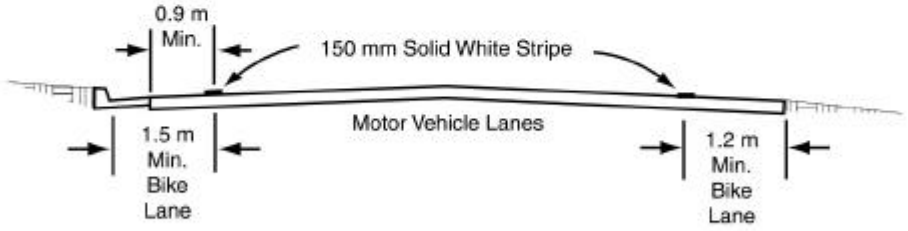
*The optional solid white stripe may be advisable where stalls are unnecessary (because parking is light) but there is concern that motorists may miscontrue the bike lane to be a traffic lane.

(1) STRIPED PARKING

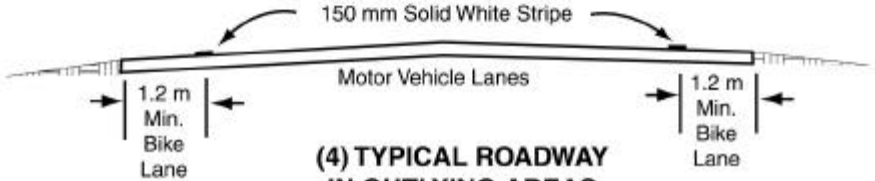


* 3.9 is recommended where there is substantial parking or turnover of parked cars is high (e.g. commerical areas).

(2) PARKING PERMITTED WITHOUT PARKING STRIPE OR STALL



(3) PARKING PROHIBITED



(4) TYPICAL ROADWAY IN OUTLYING AREAS PARKING RESTRICTED

The typical traffic lane width next to a bike lane is 3.6 m. Lane widths narrower than 3.6 m must receive approval as discussed in Index 82.2. There are situations where it may be necessary to reduce the width of the traffic lanes in order to stripe bike lanes. In determining the appropriateness of narrower traffic lanes, consideration should be given to factors such as motor vehicle speeds, truck volumes, alignment, and sight distance. Where favorable conditions exist, traffic lanes of 3.3 m may be feasible.

Bike lanes are not advisable on long, steep downgrades, where bicycle speeds greater than 50 km/h are expected. As grades increase, downhill bicycle speeds will increase, which increases the problem of riding near the edge of the roadway. In such situations, bicycle speeds can approach those of motor vehicles, and experienced bicyclists will generally move into the motor vehicle lanes to increase sight distance and maneuverability. If bike lanes are to be striped, additional width should be provided to accommodate higher bicycle speeds.

If the bike lanes are to be located on one-way streets, they should be placed on the right side of the street. Bike lanes on the left side would cause bicyclists and motorists to undertake crossing maneuvers in making left turns onto a two-way street.

(2) Striping and Signing. Details for striping and signing of bike lanes are included under Topic 1004.

Raised barriers (e.g., raised traffic bars and asphalt concrete dikes) or raised pavement markers shall not be used to delineate bike lanes. Raised barriers prevent motorists from merging into bike lanes before making right turns, as required by the Vehicle Code, and restrict the movement of bicyclists desiring to enter or exit bike lanes. They also impede routine maintenance. Raised pavement markers increase the difficulty for bicyclists when entering or exiting bike lanes, and discourage motorists from merging into bike lanes before making right turns.

Bike lane stripes should be placed a constant distance from the outside motor vehicle lane. Bike lanes with parking permitted (3.3 m to 3.9 m between the bike lane line and the curb) should not be directed toward the curb at intersections or localized areas where parking is prohibited. Such a practice prevents bicyclists from following a straight course. Where transitions from one type of bike lane to another are necessary, smooth tapers should be provided.

(3) At-grade Intersection Design. Most auto/bicycle accidents occur at intersections. For this reason, bikeway design at intersections should be accomplished in a manner that will minimize confusion by motorists and bicyclists, and will permit both to operate in accordance with the normal rules of the road.

Figure 1003.2B illustrates a typical at-grade intersection of multilane streets, with bike lanes on all approaches. Some common movements of motor vehicles and bicycles are shown. A prevalent type of accident involves straight-through bicycle traffic and right-turning motorists. Left-turning bicyclists also have problems, as the bike lane is on the right side of the street, and bicyclists have to cross the path of cars traveling in both directions. Some bicyclists are proficient enough to merge across one or more lanes of traffic, to use the inside lane or left-turn lane. However, there are many who do not feel comfortable making this maneuver. They have the option of making a two-legged left turn by riding along a course similar to that followed by pedestrians, as shown in the diagram. Young children will often prefer to dismount and change directions by walking their bike in the crosswalk.

Figure 1003.2C illustrates recommended striping patterns for bike lanes crossing a motorist right-turn-only lane. When confronted with such intersections, bicyclists will have to merge with right-turning motorists. Since bicyclists are typically traveling at speeds less than motorists, they should signal and merge

where there is sufficient gap in right-turning traffic, rather than at any predetermined location. For this reason, it is recommended that all delineation be dropped at the approach of the right-turn lane. A pair of parallel lines (delineating a bike lane crossing) to channel the bike merge is not recommended, as bicyclists will be encouraged to cross at a predetermined location, rather than when there is a safe gap in right-turning traffic.

A dashed line across the right-turn-only lane is not recommended on extremely long lanes, or where there are double right-turn-only lanes. For these types of intersections, all striping should be dropped to permit judgment by the bicyclists to prevail. A Bike Xing sign may be used to warn motorists of the potential for bicyclists crossing their path.

At intersections where there is a bike lane and traffic-actuated signal, installation of bicycle-sensitive detectors within the bike lane is desirable. Push button detectors are not as satisfactory as those located in the pavement because the cyclist must stop to actuate the push button. It is also desirable that detectors in left-turn lanes be sensitive enough to detect bicycles (see Chapter 9 of the Traffic Manual and Standard Plans for bicycle-sensitive detector designs). See Figure 1003.2D for bicycle loop detector pavement marking.

At intersections (without bike lanes) with significant bicycle use and a traffic-actuated signal, it is desirable to install detectors that are sensitive enough to detect bicycles.

(4) Interchange Design. As with bikeway design through at-grade intersections, bikeway design through interchanges should be accomplished in a manner that will minimize confusion by motorists and bicyclists. Designers should work closely with the local agency in designing bicycle facilities through interchanges. Local Agencies should carefully select interchange locations which are most suitable for bikeway designations and where the crossing meets applicable design standards. The local agency may have special needs and desires for continuity through interchanges which should be considered in the design process.

When a bike lane approaches a ramp intersection that intersects the local facility at or close to 90° (typical of a compact or spread diamond configuration), then Figure 1003.2C may be the appropriate method of getting bike lanes through the interchange.

However, when a bike lane approaches one or more ramp intersections that intersect the local facility at various angles other than 90° (typically high-speed, skewed ramps), Figure 1003.2E should be considered.

Figure 1003.2E, shows a bike lane through a typical interchange. The 150 mm bike lane stripe should be dropped 30 m prior to the ramp intersection as shown in the figure to allow for adequate weaving distance. **The shoulder width shall not be reduced through the interchange area. The minimum shoulder width shall match the approach roadway shoulder width, but not less than 1.2 m or 1.5 m if a gutter exists. If the shoulder width is not available, the designated bike lane shall end at the previous local road intersection.**

Depending on the intersection angles, either Figure 1003.2C or 1003.2E should also be used for multilane ramp intersections. Additionally, the outside through lane should be widened to 4.2 m when feasible. This allows extra room for bicycles to share the through lane with vehicles. The outside shoulder width should not be reduced through the interchange area to accommodate this additional width.

1003.3 Class III Bikeways

Class III bikeways (bike routes) are intended to provide continuity to the bikeway system. Bike routes are established along through routes not served by Class I or II bikeways, or to connect discontinuous segments of bikeway (normally bike lanes). Class III facilities are shared facilities, either with motor vehicles on the street, or with pedestrians on sidewalks, and in either case bicycle usage is secondary. Class III facilities are established by placing Bike Route signs along roadways.

Figure 1003.2B

Typical Bicycle/Auto Movements at Intersections of Multilane Streets

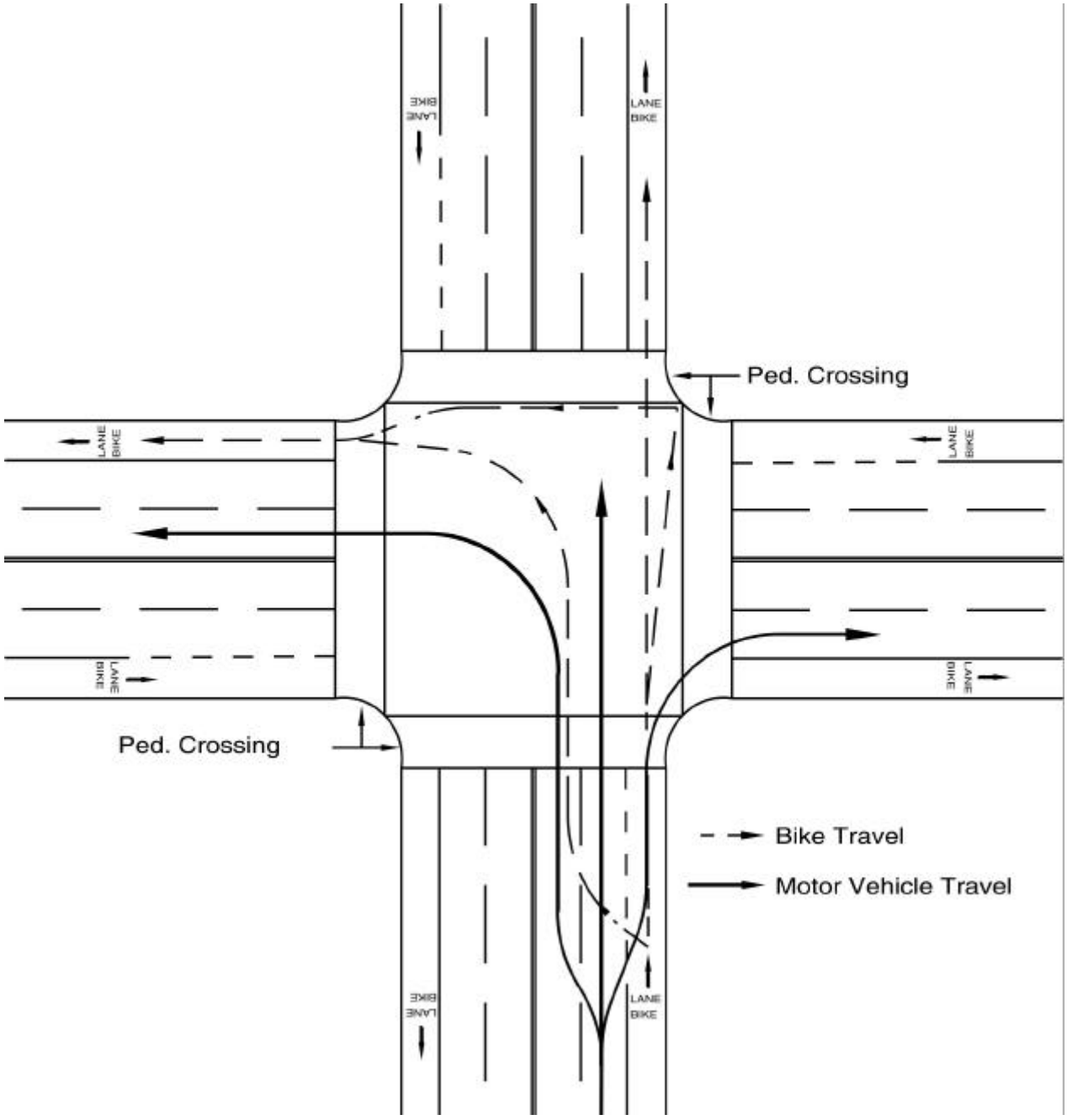


Figure 1003.2C
Bike Lanes Approaching Motorist
Right-turn-only Lane

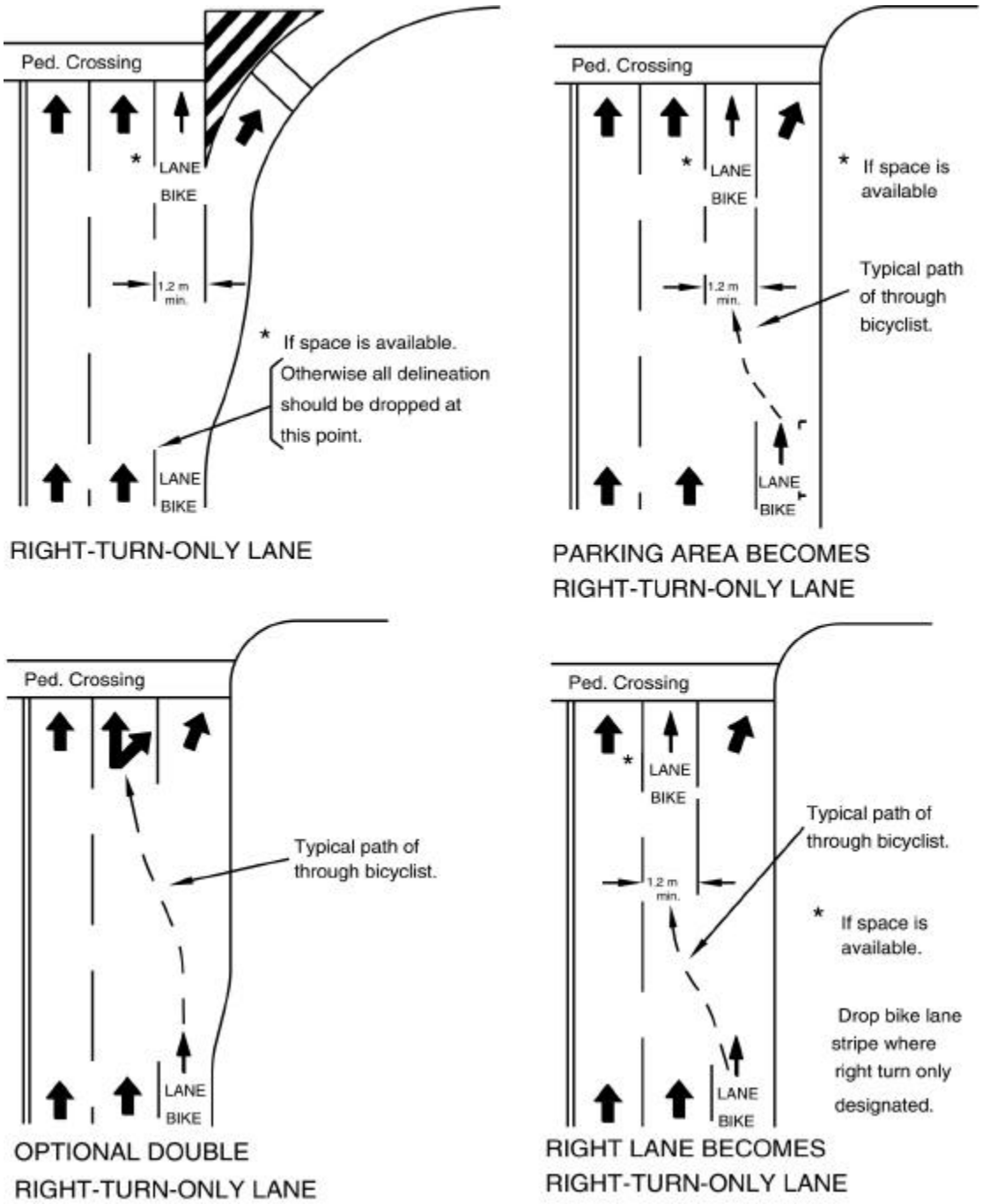


Figure 1003.2D
Bike Loop Detector Pavement Marking

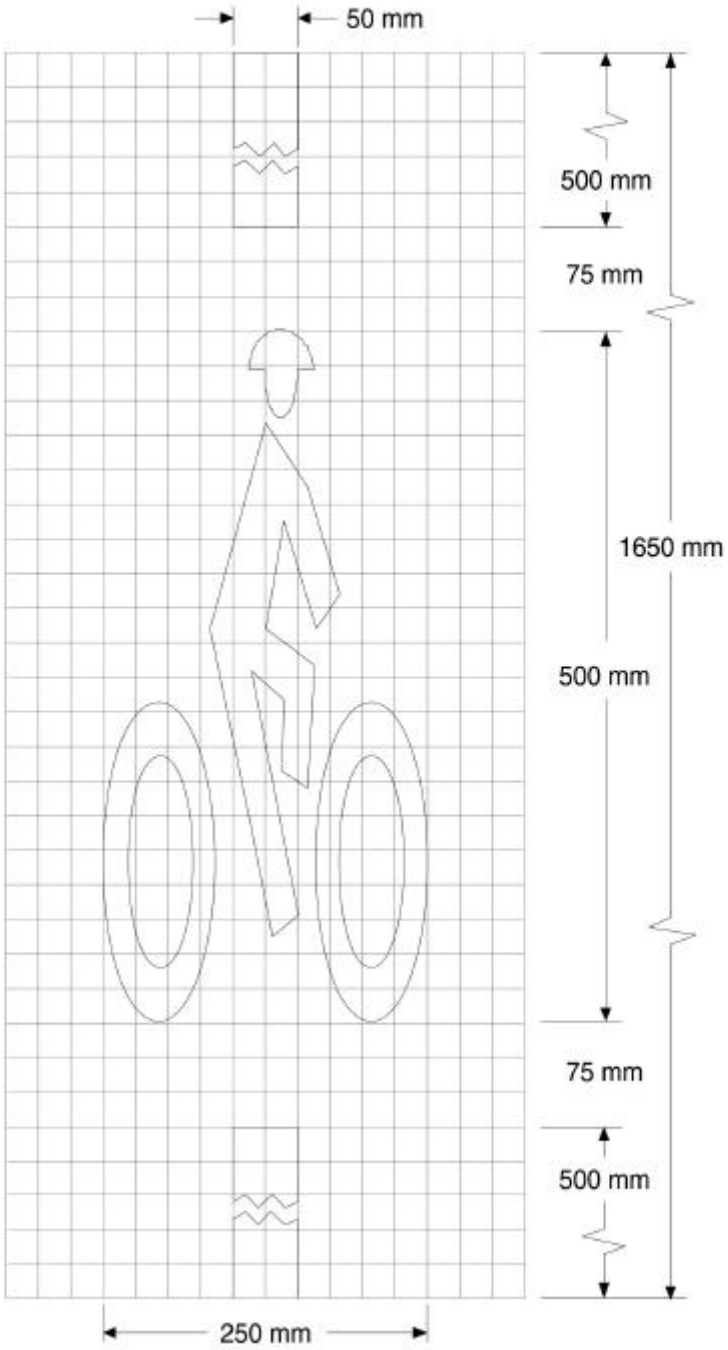
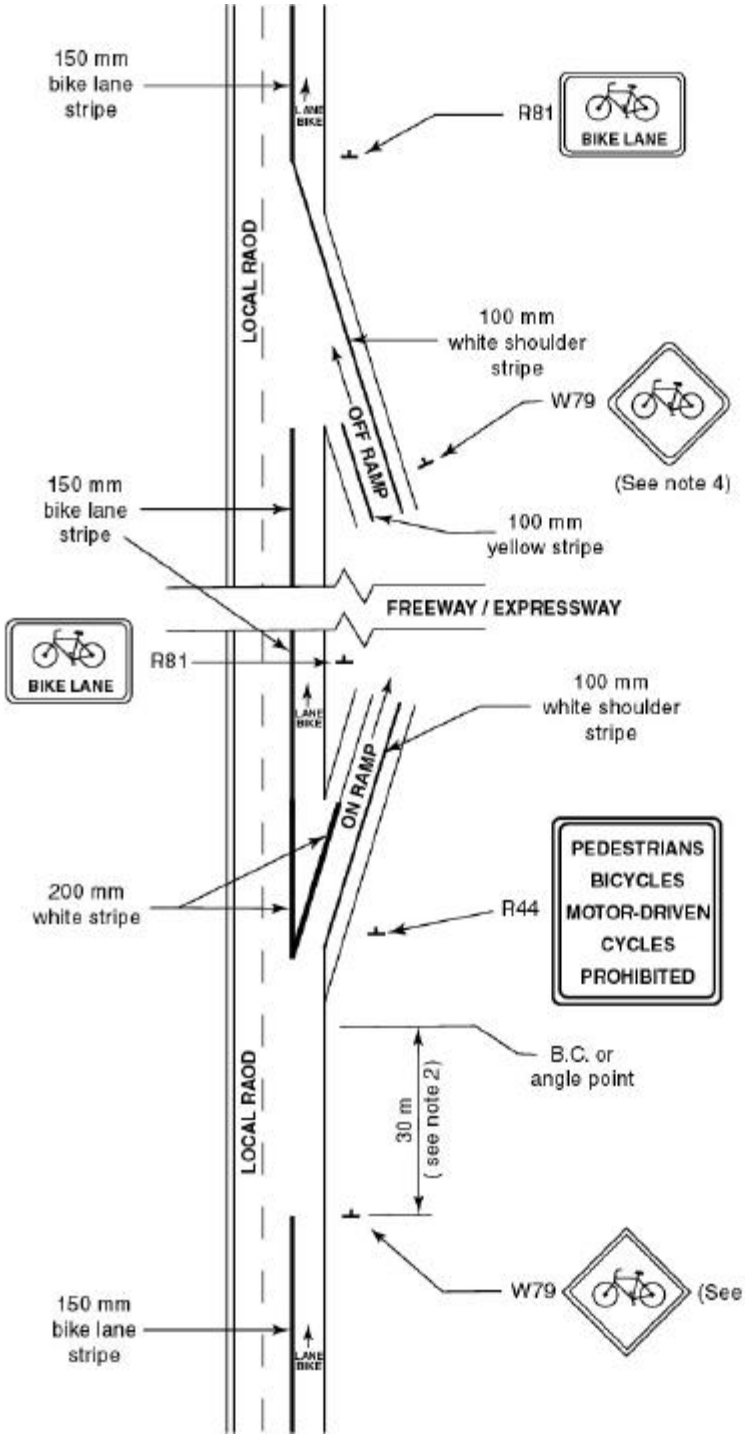


Figure 1003.2E

Bike Lanes Through Interchanges



Notes:

1.) See Index 1003.2 (4) for additional information.

2.) At additional on-ramps within the interchange the signing & striping as shown shall be repeated. Where the on-ramps intersect at the local road at or near 90 degrees, the striping should follow Figure 1003.2C.

3.) The shoulder width shall not be reduced through the interchange area. The minimum shoulder width shall match the approach roadway shoulder width, but not less than 1.2 m or 1.5 m if a gutter exists. If the shoulder width is not available, the designated bike lane shall end at the previous llocal raod intersection.

4.) The W79 signs are optional and should be used only when determined appropriate by the Engineer.

5.) See Index 1003.3 (4) for information on Bike Routes Through Interchanges.

Minimum widths for Class III bikeways are not presented, as the acceptable width is dependent on many factors, including the volume and character of vehicular traffic on the road, typical speeds, vertical and horizontal alignment, sight distance, and parking conditions.

Since bicyclists are permitted on all highways (except prohibited freeways), the decision to sign the route should be based on the advisability of encouraging bicycle travel on the route and other factors listed below.

(1) On-street Bike Route Criteria. To be of benefit to bicyclists, bike routes should offer a higher degree of service than alternative streets. Routes should be signed only if some of the following apply:

(a) They provide for through and direct travel in bicycle-demand corridors.

(b) Connect discontinuous segments of bike lanes.

(c) An effort has been made to adjust traffic control devices (stop signs, signals) to give greater priority to bicyclists, as compared with alternative streets. This could include placement of bicycle-sensitive detectors on the right-hand portion of the road, where bicyclists are expected to ride.

(d) Street parking has been removed or restricted in areas of critical width to provide improved safety.

(e) Surface imperfections or irregularities have been corrected (e.g., utility covers adjusted to grade, potholes filled, etc.).

(f) Maintenance of the route will be at a higher standard than that of other comparable streets (e.g., more frequent street sweeping).

(2) Sidewalk Bikeway Criteria. In general, the designated use of sidewalks (as a Class III bikeway) for bicycle travel is unsatisfactory.

It is important to recognize that the development of extremely wide sidewalks does not necessarily add to the safety of sidewalk bicycle travel, as wide sidewalks will encourage higher speed bicycle use and can increase potential for conflicts with motor vehicles at intersections, as well as with pedestrians and fixed objects.

Sidewalk bikeways should be considered only under special circumstances, such as:

(a) To provide bikeway continuity along high speed or heavily traveled roadways having inadequate space for bicyclists, and uninterrupted by driveways and intersections for long distances.

(b) On long, narrow bridges. In such cases, ramps should be installed at the sidewalk approaches. If approach bikeways are two-way, sidewalk facilities should also be two-way.

Whenever sidewalk bikeways are established, a special effort should be made to remove unnecessary obstacles. Whenever bicyclists are directed from bike lanes to sidewalks, curb cuts should be flush with the street to assure that bicyclists are not subjected to problems associated with crossing a vertical lip at a flat angle. Also curb cuts at each intersection are necessary, as well as bikeway yield or stop signs at uncontrolled intersections. Curb cuts should be wide enough to accommodate adult tricycles and two-wheel bicycle trailers.

In residential areas, sidewalk riding by young children too inexperienced to ride in the street is common. With lower bicycle speeds and lower auto speeds, potential conflicts are somewhat lessened, but still exist. Nevertheless, this type of sidewalk bicycle use is accepted. But it is inappropriate to sign these facilities as bikeways. Bicyclists should not be encouraged (through signing) to ride facilities that are not designed to accommodate bicycle travel.

(3) Destination Signing of Bike Routes. For Bike Route signs to be more functional, supplemental plates may be placed beneath them when located along routes leading to high demand destinations (e.g., "To Downtown"; "To State College"; etc.-- see Figure 1004.4 for typical signing).

There are instances where it is necessary to sign a route to direct bicyclists to a logical destination, but where the route does not offer any of the above listed bike route features. In such cases, the route should not be signed as a bike route; however, destination signing may be advisable. A typical application of destination signing would be where bicyclists are directed off a highway to bypass a section of freeway. Special signs would be placed to guide bicyclists to the next logical destination. The intent is to direct bicyclists in the same way as motorists would be directed if a highway detour was necessitated.

(4) Interchange Design As with bikeway design through at-grade intersections, bikeway design through interchanges should be accomplished in a manner that will minimize confusion by motorists and bicyclists. Designers should work closely with the local agency in designing bicycle facilities through interchanges. Local Agencies should carefully select interchange locations which are most suitable for bikeway designations and where the crossing meets applicable design standards. The local agency may have special needs and desires for continuity through interchanges which should be considered in the design process.

Figure 1003.2E may also be used where the preferred designation is a class III (bike route), with the R81 signs being replaced with G93 signs and the bike lane delineation eliminated. A 100 mm stripe may be used to delineate the shoulder through out the bike route designation**. Within the Interchange area the bike route shall require either an outside lane width of 4.8 m or a 3.6 m lane and a 1.2 m shoulder. If the above width is not available, the designated bike route shall end at the previous local road intersection.**

1003.4 Bicycles on Freeways

In some instances, bicyclists are permitted on freeways. Seldom would a freeway be signed or striped as a bikeway, but it can be opened for use if it meets certain criteria. Essentially, the criteria involve assessing the safety and convenience of the freeway as compared with available alternate routes. However, a freeway should not be opened to bicycle use if it is determined to be incompatible. The Headquarters Traffic Liaisons and the Project Development Coordinator must approve any proposals to open freeways to bicyclists.

If a suitable alternate route exists, it would normally be unnecessary to open the freeway. However, if the alternate route is unsuitable for bicycle travel the freeway may be a better alternative for bicyclists. In determining the suitability of an alternate route, safety should be the paramount consideration. The following factors should be considered:

- Number of intersections
- Shoulder widths
- Traffic volumes
- Vehicle speeds
- Bus, truck and recreational vehicle volumes
- Grades
- Travel time

When a suitable alternate route does not exist, a freeway shoulder may be considered for bicycle travel. Normally, freeways in urban areas will have characteristics that make it unfeasible to permit bicycle use. In determining if the freeway shoulder is suitable for bicycle travel, the following factors should be considered;

- Shoulder widths
- Bicycle hazards on shoulders (drainage grates, expansion joints, etc.)
- Number and location of entrance/exit ramps
- Traffic volumes on entrance/exit ramps

When bicyclists are permitted on segments of freeway, it will be necessary to modify and supplement freeway regulatory signs, particularly those at freeway ramp entrances and exits (see Chapter 4 of the Traffic Manual).

Where no reasonable alternate route exists within a freeway corridor, the Department should coordinate with local agencies to develop or improve

existing routes or provide parallel bikeways within or adjacent to the freeway right of way.

The long term goal is to provide a safe and convenient non-freeway route for bicycle travel.

1003.5 Multipurpose Trails

In some instances, it may be appropriate for agencies to develop multipurpose trails - for hikers, joggers, equestrians, bicyclists, etc. Many of these trails will not be paved and will not meet the standards for Class I bikeways. As such, these facilities should not be signed as bikeways. Rather, they should be designated as multipurpose trails (or similar designation), along with regulatory signing to restrict motor vehicles, as appropriate.

If multipurpose trails are primarily to serve bicycle travel, they should be developed in accordance with standards for Class I bikeways. In general, multipurpose trails are not recommended as high speed transportation facilities for bicyclists because of conflicts between bicyclists and pedestrians. Wherever possible, separate bicycle and pedestrian paths should be provided. If this is not feasible, additional width, signing and striping should be used to minimize conflicts.

It is undesirable to mix mopeds and bicycles on the same facility. In general, mopeds should not be allowed on multipurpose trails because of conflicts with slower moving bicyclists and pedestrians. In some cases where an alternate route for mopeds does not exist, additional width, signing, and striping should be used to minimize conflicts. Increased patrolling by law enforcement personnel is also recommended to enforce speed limits and other rules of the road.

It is usually not desirable to mix horses and bicycle traffic on the same multipurpose trail. Bicyclists are often not aware of the need for slower speeds and additional operating space near horses. Horses can be startled easily and may be unpredictable if they perceive approaching bicyclists as a danger. In addition, pavement requirements for safe bicycle travel are not suitable for horses. For these reasons, a bridle trail separate from the multipurpose trail is recommended wherever possible.

1003.6 Miscellaneous Bikeway Criteria

The following are miscellaneous bikeway criteria which should be followed to the extent pertinent to Class I, II and III bikeways. Some, by their very nature, will not apply to all classes of bikeway. Many of the criteria are important to consider on any highway where bicycle travel is expected, without regard to whether or not bikeways are established.

(1) Bridges. Bikeways on highway bridges must be carefully coordinated with approach bikeways to make sure that all elements are compatible. For example, bicycle traffic bound in opposite directions is best accommodated by bike lanes on each side of a highway. In such cases, a two-way bike path on one side of a bridge would normally be inappropriate, as one direction of bicycle traffic would be required to cross the highway at grade twice to get to and from the bridge bike path. Because of the inconvenience, many bicyclists will be encouraged to ride on the wrong side of the highway beyond the bridge termini.

The following criteria apply to a two-way bike path on one side of a highway bridge:

(a) The bikeway approach to the bridge should be by way of a separate two-way facility for the reason explained above.

(b) **A physical separation, such as a chain link fence or railing, shall be provided to offset the adverse effects of having bicycles traveling against motor vehicle traffic.** The physical separation should be designed to minimize fixed end hazards to motor vehicles and if the bridge is an interchange structure, to minimize sight distance restrictions at ramp intersections.

It is recommended that bikeway bridge railings or fences placed between traffic lanes and bikeways be at least 1.4 m high to minimize the likelihood of bicyclists falling over the railings. Standard bridge railings which are lower than 1.4 m can be retrofitted with lightweight upper railings or chain link fence suitable to restrain bicyclists.

Separate highway overcrossing structures for bikeway traffic shall conform to Caltrans' standard pedestrian overcrossing design loading. The minimum clear width shall be the paved width of the approach bikeway but not less than 2.4 m. If pedestrians are to use the structure, additional width is recommended.

(2) Surface Quality. The surface to be used by bicyclists should be smooth, free of potholes, and the pavement edge uniform. For rideability on new construction, the finished surface of bikeways should not vary more than 6 mm from the lower edge of a 2.4 m long straight edge when laid on the surface in any direction.

Table 1003.6

Bikeway Surface Tolerances

Direction of Travel	Grooves(1)	Steps(2)
Parallel to travel	No more than 12 mm wide	No more than 10 mm high
Perpendicular to travel	---	No more than 20 mm high

(1) Groove--A narrow slot in the surface that could catch a bicycle wheel, such as a gap between two concrete slabs.

(2) Step--A ridge in the pavement, such as that which might exist between the pavement and a concrete gutter or manhole cover; or that might exist between two pavement blankets when the top level does not extend to the edge of the roadway.

Table 1003.6 indicates the recommended bikeway surface tolerances for Class II and III bikeways developed on existing streets to minimize the potential for causing bicyclists to lose control of their bicycle (Note: Stricter tolerances should be achieved on new bikeway construction.) Shoulder rumble strips are not suitable as a riding surface for bicycles. See Traffic Manual Section 6-03.2 for additional information regarding rumble strip design considerations for bicycles.

(3) Drainage Grates, Manhole Covers, and Driveways. Drainage inlet grates, manhole covers, etc., on bikeways should be designed and installed in a manner that provides an adequate surface for bicyclists. They should be maintained flush with the surface when resurfacing.

Drainage inlet grates on bikeways shall have openings narrow enough and short enough to assure bicycle tires will not drop into the grates (e.g., reticuline type), regardless of the direction of bicycle travel. Where it is not immediately feasible to replace existing grates with standard grates designed for bicycles, 25 mm x 6 mm steel cross straps should be welded to the grates at a spacing of 150 mm to 200 mm on centers to reduce the size of the openings adequately.

Corrective actions described above are recommended on all highways where bicycle travel is permitted, whether or not bikeways are designated.

Future driveway construction should avoid construction of a vertical lip from the driveway to the gutter, as the lip may create a problem for bicyclists when entering from the edge of the roadway at a flat angle. If a lip is deemed necessary, the height should be limited to 15 mm.

(4) At-grade Railroad Crossings and Cattle Guards. Whenever it is necessary to cross railroad tracks with a bikeway, special care must be taken to assure that the safety of bicyclists is protected. The bikeway crossing should be at least as wide as the approaches of the bikeway. Wherever possible, the crossing should be straight and at right angles to the rails. For on-street bikeways where a skew is unavoidable, the shoulder (or bike lane) should be widened, if possible, to permit bicyclists to cross at right angles (see Figure 1003.6A). If this is not possible, special construction and materials should be considered to keep the flangeway depth and width to a minimum.

Figure 1003.6A
Railroad Crossings

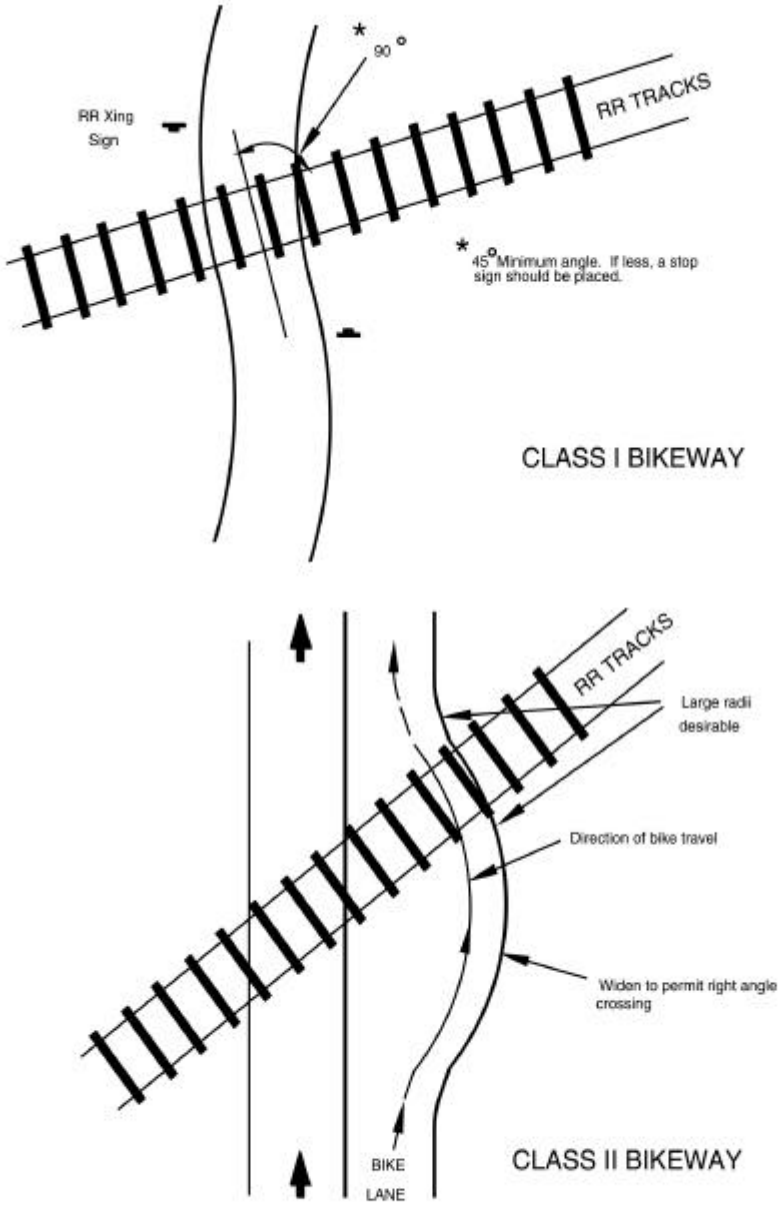
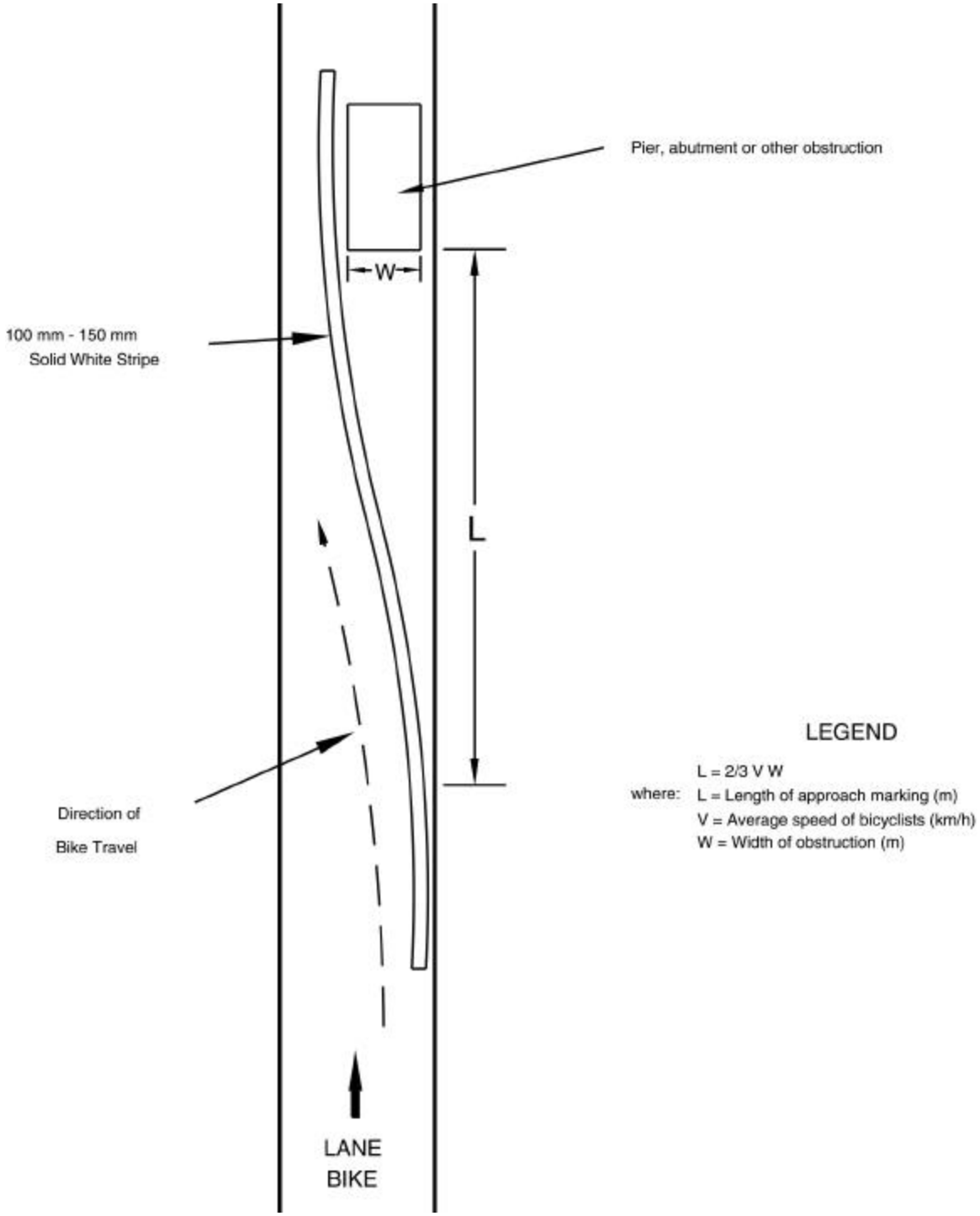


Figure 1003.6B

Obstruction Markings



Pavement should be maintained so ridge buildup does not occur next to the rails. In some cases, timber plank crossings can be justified and can provide for a smoother crossing. Where hazards to bicyclist cannot be avoided, appropriate signs should be installed to warn bicyclists of the danger.

All railroad crossings are regulated by the California Public Utilities Commission (CPUC). All new bike path railroad crossings must be approved by the CPUC. Necessary railroad protection will be determined based on a joint field review involving the applicant, the railroad company, and the CPUC.

The presence of cattle guards along any roadway where bicyclists are expected should be clearly marked with adequate advance warning.

(5) Obstruction Markings. Vertical barriers and obstructions, such as abutments, piers, and other features causing bikeway constriction, should be clearly marked to gain the attention of approaching bicyclists. This treatment should be used only where unavoidable, and is by no means a substitute for good bikeway design. An example of an obstruction marking is shown in Figure 1003.6B. Signs, reflectors, diagonal black and yellow markings, or other treatments will be appropriate in other instances to alert bicyclists to potential obstructions.

Topic 1004 - Uniform Signs, Markings and Traffic Control Devices

1004.1 Introduction

Per Section 891 of the Streets and Highways Code, uniform signs, markings, and traffic control devices shall be used. As such this section is mandatory, except where permissive language is used. See the Traffic Manual for detailed specifications.

1004.2 Bike Path (Class I)

An optional 100 mm yellow stripe may be placed to separate opposing directions of travel. (See Index 1003.1(3) for additional information.) A 0.9 m long stripe with a 2.7 m space is the recommended striping pattern, but may be revised, depending on the situation.

Standard regulatory, warning, and guide signs used on highways may be used on bike paths, as appropriate (and may be scaled down in size). Special regulatory, warning, and guide signs may also be used to meet specific needs.

White painted word (or symbol) warning markings on the pavement may be used as an effective means of alerting bicyclists to approaching hazards, such as sharp curves, barrier posts, etc.

1004.3 Bike Lanes (Class II)

Bike lanes require standard signing and pavement markings as shown on Figure 1004.3. This figure also depicts the proper method of striping bike lanes through intersections. Bike lane lines are not typically extended through intersections. Where motor vehicle right turns are not permitted, the solid bike lane stripe should extend to the edge of the intersection, and begin again on the far side. Where right turns are permitted, the solid stripe should terminate 30 m to 60 m prior to the intersection. A dashed line, as shown in Figure 1004.3, may be carried to, or near, the intersection. Where city blocks are short (less than 120 m), the length of dashed stripe is typically close to 30 m. Where blocks are longer or motor vehicle speeds are high (greater than 60 km/h), the length of dashed stripe should be increased to 60 m.

In addition to the required "Bike Lane" pavement marking, an optional bike lane symbol may be used as shown on Figure 1004.4 to supplement the word message.

The R81 bike lane sign shall be placed at the beginning of all bike lanes, on the far side of every arterial street intersection, at all major changes in direction, and at maximum 1 km intervals.

Bike lane pavement markings shall be placed on the far side of each intersection, and may be placed at other locations as desired.

Raised pavement markers or other raised barriers shall not be used to delineate bike lanes.

The G93 Bike Route sign may also be used along bike lanes, but its primary purpose should be to provide directional signing and destination signing where necessary. A proliferation of Bike Route signs along signed and striped bike lanes serves no useful purpose.

Many signs on the roadway also will apply to bicyclists in bike lanes. Standard regulatory, warning, and guide signs used specifically in conjunction with bike lanes are shown in Chapter 4 of the Traffic Manual.

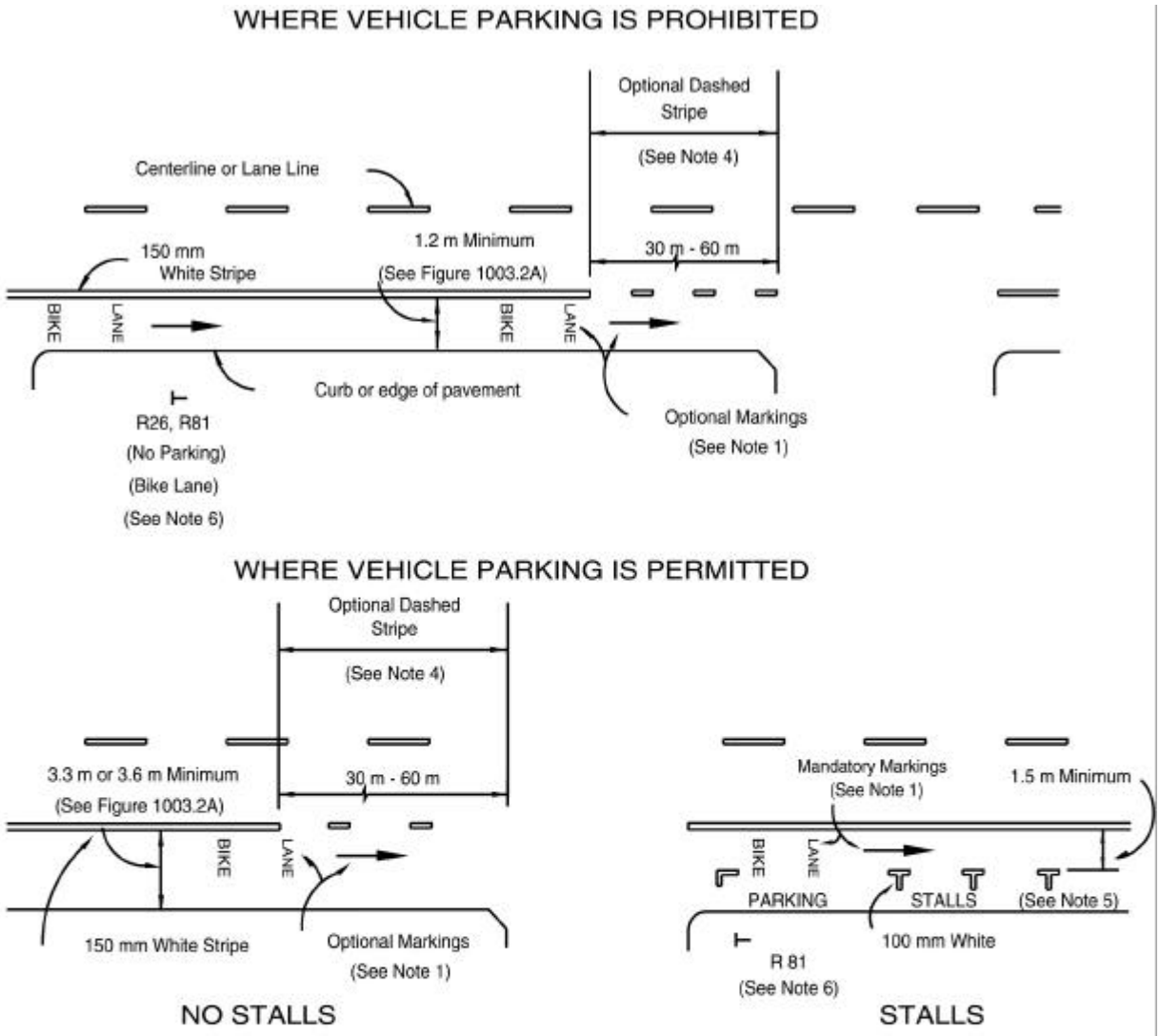
1004.4 Bike Routes (Class III)

Bike routes are shared routes and do not require pavement markings. In some instances, a 100 mm white edge stripe separating the traffic lanes from the shoulder can be helpful in providing for safer shared use. This practice is particularly applicable on rural highways, and on major arterials in urban areas where there is no vehicle parking.

Bike routes are established through placement of the G93 Bike Route sign. Bike route signs are to be placed periodically along the route. At changes in direction, the bike route signs are supplemented by G33 directional arrows. Typical bike route signing is shown on Figure 1004.5. The figure shows how destination signing, through application of a special plate, can make the Bike Route sign more functional for the bicyclist. This type of signing is recommended when a bike route leads to a high demand destination (e.g., downtown, college, etc.).

Many signs on the roadway also will apply to bicyclists. Standard warning and guide signs used specifically in conjunction with bike routes are shown in Chapter 4 of the Traffic Manual.

Figure 1004.3
Bike Lane Signs and Markings



NOTES:

1. The Bike Lane pavement markings shall be placed on the far side of each intersection, and may be placed at other locations as desired.
2. The use of the bicycle symbol pavement marking to supplement the word message is optional.
3. The G93 Bike Route sign may be placed intermittently along the bike lane if desired.
4. Where motorist right turns are permitted, the solid bike lane line shall either be dropped entirely, or dashed as shown, beginning at a point between 30 m and 60 m in advance of the intersection. Refer to Detail 39A in the Traffic Manual for striping pattern dimensions.
5. In areas where parking stalls are not necessary (because parking is light), it is permissible to paint a 100 mm solid white stripe to fully delineate the bike lane. This may be advisable where there is concern that motorists may misconstrue the bike lane to be a traffic lane.
6. The R81 bike lane sign shall be placed at the beginning of all bike lanes, on the far side of every arterial street intersection, at all major changes in direction, and at maximum 0.8 km intervals.

Figure 1004.4
Bike Lane Symbol

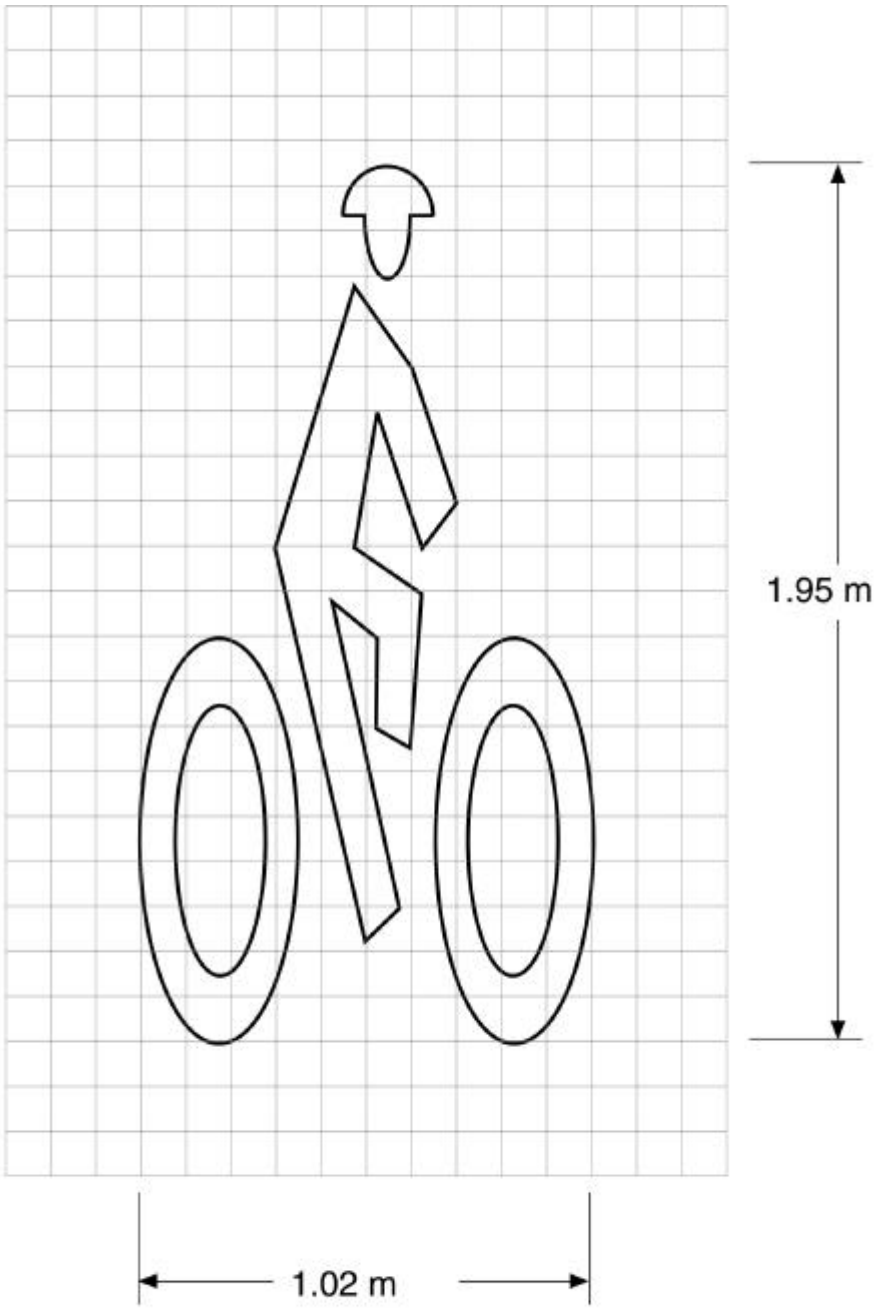
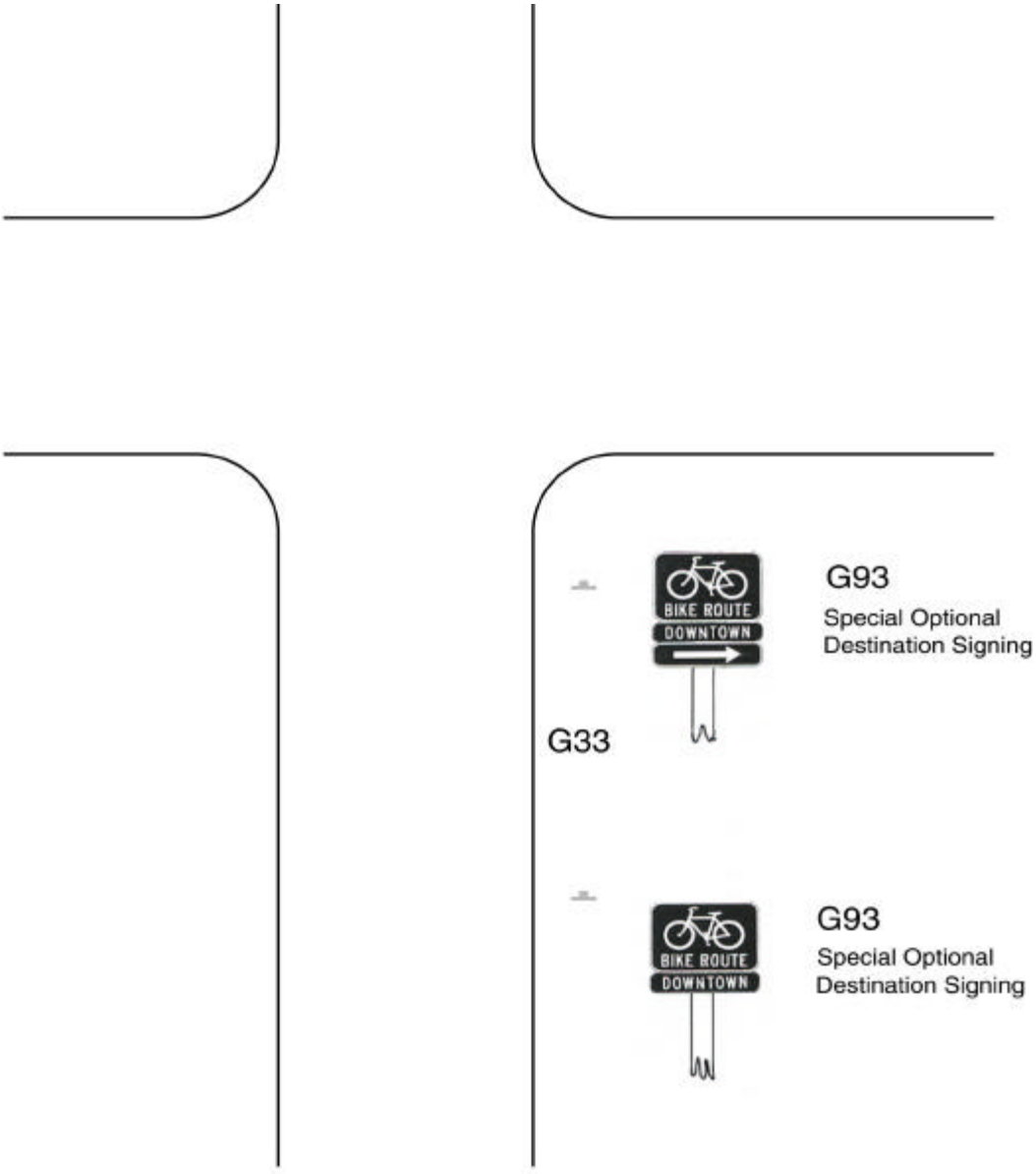


Figure 1004.5

Bike Route Signing



NOTES: The G93 Bike Route signs shall be placed at all points where the route changes direction and periodically as necessary.